III. THE LAKES OF NORTHEASTERN INDIANA

By

Will Scott

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INTRODUCTION

This study is concerned with the principal lakes of four counties of northeastern Indiana, i. e., Steuben, LaGrange, Noble, and Whitley. Not all the lakes of these counties have been examined, but the number studied includes all types and gives a fair and sound picture of conditions in this region. The summer of 1929 was devoted to the lakes of Steuben County. A temporary camp and laboratory was set up at the state park on Lake James. The central location of this point and the special interest attaching to Lake James made this location very advantageous. In 1930 the lakes of the other three counties were reached from the Biological Station of Indiana University. A smaller number of lakes were examined in 1930 because the lakes were farther apart and the consequent travel greater.

It is frankly an exploratory study. Dr. W. M. Tucker, working for the Department of Conservation, had mapped Lakes James, Snow, Crooked, Clear, and Gage in Steuben County; Adams and Oliver Lakes in Noble County and Crooked, Shriner, and Round Lakes in Whitley County. Other than this nothing was known of this group except the incidental work done on them by Dayer in his work on the topography and glaciation of the region, and the mere superficial descriptions of some of them by various people.

It is well known that the summer temperature and the consequent distribution of dissolved oxygen, and carbon dioxide together with the amount of carbonates in a lake are fundamental elements in their economy. This together with the summer plankton gives a fair picture of the nature of any lake.

These facts have been determined and expressed in a series of 68 tables. These data are discussed in the body of the paper and some deductions are made. Certain difficulties have been met. The most important is the lack of topographic maps of the region. Problems connected with the carbonates are intimately related to the topography and their solution awaits the construction of such maps. A minor difficulty has been the naming of the lakes discussed in the paper. The same lake often has more than one name; for instance, Hamilton and Fish refer to the same lake, as do Garden and Golden. The same name is often applied to different lakes. The name Crooked is applied to rather important lakes in both Steuben and Whitley Counties. To obviate this difficulty a table is introduced giving the township, range, and sections occupied in part or in whole by each lake.

ACKNOWLEDGMENTS

It is a pleasure to acknowledge the hearty cooperation of the late George N. Mannfield, Superintendent of the Division of Fish and Game, and of his successor Walter Shirts, a man of sound judgment.

The field assistants in 1929 were Herman T. Spieth, Raymond J. Myers, and Ancil D. Holloway. In 1930 they were Raymond J. Myers and Mychyle W. Johnson. Their careful work adds much to the quality of the results.

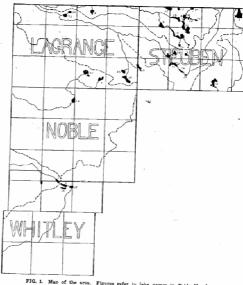
In the laborious work of counting the plankton, I was assisted by Miss Mary I. Spilman and Miss Lois E. Smith. I am also indebted to Dr. Harold for calculating the coefficient of correlation between the carbonates and certain diatoms.

The Graduate School of Indiana University furnished funds for the apparatus and incidental expenses. I am especially grateful to Dr. Fernandus Payne, its Dean and my colleague, for his kindly encouragement.

TABLE No. 1. Location of lakes by township, range, and section. The serial numbers at the left correspond to the numbers on fig. 1, which is the map of the four counties.

	Lake	TN	RE	Sec.
1.	Adams, Lagrange	36	10	23-24-25-26
2.	Cedar, Lagrange	38	10	21-22
3.	Cedar, Whitley	32	9	2-11-12
4.	Center, Steuben	37	13	22
5.	Clear, Steuben	38	15	17-18-19-20-29-30
6.	Crooked, Steuben.	37 37	13 12	6-7-8-9-16-17 1
7.	Crooked, Whitley	32 33	9	3-4 33-34
8.	Fox, Steuben	37	13	28-33-34
9.	Gage, Steuben	38 37	12 12	34-35
10.	George, Steuben	38	13	14-15+Mich.
11.	Golden, Steuben	36 36	12 12	1 5-6-8
12.	Hamilton, Steuben	36	14	28-33-21-27
13.	Hog, Steuben	38	13	17+Mich.
14.	Hogback, Steuben	37 37	12 13	25-36 31
15.	James, Steuben	38 37	13 13	28-33-34 3-4-10
16.	Jimerson, Steuben	38 37	13 13	30-31-32 5
17.	Lake Pleasant, Steuben	38 38	13 12	18- 12-13+Mich.
18.	Long, Lagrange	36	11	22-26-27
19.	Long, Steuben	36	13	15-16
20.	Loon, Steuben	37	13	20
21.	Marsh, Steuben	38	13	25
22.	Oliver, Lagrange	36	10	17-18-19-20
23.	Otter (L.), Steuben	38	13	26-27
24.	Otter (U.), Steuben	38	13	26-27
25.	Pleasant L., Steuben	36	13	22-23-14-15
26.	Pretty, Lagrange	36	11	15-16
27.	Round, Whitley	32	9	12
28.	Shriner, Whitley	32	9	2-11-12
29.	Silver, Steuben	37	13	29-30-31-32
30.	Snow, Steuben	. 38	13	21-22-27-28
31.	Big Turkey Lagrange.	36 36	12 11	7-18 13
32.	Twin (N.), Lagrange	38	9	23
33.	Twin (S.), Lagrange	38	9	26-27
34	Wallen, Noble	. 35	13	13

TN—Township North. RE—Range East. SEC.—Section. Serial numbers indicate lake names on map No. 1.



DRAINAGE

The four counties Steuben, LaGrange, Noble, and Whitley, which include the lakes of this report, form a "parting of the ways" so far as surface drainage is concerned. From them the waters may go to Lake Erie through the Maumee, to Lake Michigan through the St. Joseph of Michigan, or to the Gulf of Mexico through the tributaries of the Wabash which in turn empties into the Ohio and thence to the Mississippi and the Gulf.

In Whitley County, Cedar, Shriner and Round Lakes are drained by the Eel River, which is tributary to the Wabash. Over a low divide is Crooked Lake of Whitley County, which empties into the Wabash through the Tippecanoe River.

Adams and Oliver Lakes of LaGrange County and Wallen Lake of Noble County are tributary to the Elkhart River. Fox, Pleasant, Long, Golden, and Silver Lakes of Steuben County; Big Turkey Lake of Steuben and LaGrange Counties; and Long, Pretty, North Twin, and South Twin Lakes of LaGrange County all empty into the Pigeon River.

Faun River drains two series in Steuben County. The first series is composed of Marsh, Upper Otter, Lower Otter, George, Snow, James, and Jimerson Lakes. The second consists of Center, Loon, Crooked, and Gage. In addition to this, the Faun River drains Cedar Lake of LaGrange County. These three rivers, the Elkhart, the Pigeon, and the Faun, are tributaries of the St. Joseph River of Michigan. The St. Joseph also drains Lake Pleasant and Hog Lake. The outlet of Clear Lake flows northwest and south through Michigan and Ohio to St. Joseph of the Maumee. Hamilton reaches the same stream through Fish Creek.

GLACIATION AND LAKE FORMATION

The lakes of this region are due to the Pleistocene glaciation. While much glacial drift was undoubtedly brought into Indiana by the earlier ice advances, the present distribution and topography are due to the last or Wisconsin ice sheet. This ice sheet advanced into Indiana in three great lobes, which were given direction by the basins of Lake Michigan, Saginaw Bay of Lake Huron, and the combined influences of Lakes Huron and Eric. Consequently, these lobes are called the Michigan, the Saginaw, and the Huron-Erie. Of these three lobes the Huron-Erie advanced into the northern part of eastern Indiana from the northeast; the Michigan lobe advanced into western Indiana from the north, and between these two came the Saginaw Lobe. The influence of the Michigan Lobe is outside the area considered in this paper and will not be discussed.

Leverett (1915) has determined that the Saginaw Lobe retreated first. The general climatic conditions at the same latitude must have been uniform over all three lobes. The early retreat of the Saginaw indicates that it had less mass and power than the other two. This fact and the form of the moraines (Leverett, L. C., map No. VI.) indicate that ice derived from the Saginaw lobe did not extend south of the present Wabash River nor its major tributary, the Eel River.

This massive system of moraines extends from the northeast corner of the state southwest for about seventy-five miles. In this mass occur the lakes which are discussed in this paper. While Dryer (1891, pp. 114-120) and Leverett (I. c.) attribute most of this material to the work of the Huron-Erie lobe, the region must be regarded as interlobate in the sense that both lobes influence it.

From this mass which coalesces in Steuben and a part of Noble and DeKalb Counties, there extends southwest three limbs. The eastern one is the ill defined Salamonie moraine, the middle one becomes the Mississinewa. Both of these are clearly terminal moraines of the Huron-Erie lobe.

The third and western of these three extends to the southwest, paralleling the Eel River from Whitley County to Logansport. It was along this western mass and in the coalesced moraines from Whitley County to the northeast that the great ice lobes were in contact at the time of the maximum development of the Saginaw lobe. Not only did each contribute material from its lateral and terminal moraine, but as the opposing masses varied both in thickness and force, there must have been local over-riding of one mass by the other. For reasons already given, the Huron-Erie usually did the over-riding. This resulted in buried masses of ice which eventually, on melting, caused lake beds and outwash channels.

In the case of Tippecanoe Lake and the Barbee system, it was determined (Scott, 1915, p. 5) that the drainage lines were between finger-like lobes of ice. Great water-laid deposits were laid down between masses of ice. When the ice melted, the anomalous condition was produced, namely, lakes separated by water-laid ridges.

Dryer (1891, p. 133) accurately describes the condition in Steuben County as two great moraines running northeast to southwest and the streams running to the northwest. Three of these streams follow channels through the western and more massive of these two moraines. His interpretation that these channels antedate the moraines is incorrect. Also his interpretation that they formed outwash channels from the Huroh-Erie Lobe is untenable, unless it is assumed that there were great masses of stagnant ice underlying these water courses and that the subsequent melting of these ice masses caused the lakes now found in these vallevs.

The accurate interpretation of this whole interlobate region must await detailed studies. These studies must include the making of a topographic map, the correlation of the logs of wells, study of the water stratified drift, outwash channels, and the identification of the materials of the deposits and their point of origin. Until these data are at hand speculation as to details is futile.

CARBONATES

These lakes are all relatively hard water lakes. The "hardness" is due to carbonates, chiefly those of calcium, although a smaller amount of magnesium is usually present. These carbonates vary from 24.96 cc. of carbon dioxide per liter in Loon Lake to 54.73 in Golden Lake.

The carbonates are leached from the glacial deposits above the lake levels, and their primary source is the limestones and dolomites of the Devonian and

Silurian deposits to the northeast. They are found on the shores of Lakes Huron and Erie, on the east side of the "thumb" of Michigan, in Ohio, and in southern Ontario. These glacial deposits are very heterogenous. Many analyses will have to be made before any significant average is obtained. Collections fifteen to twenty feet below the surface in a fresh gravel pit near Winona Lake averaged 9.4% of calcium carbonate. Besides this little known factor, the amount of carbonate in the moraines, two processes seem to influence the amount of carbonates in a lake, namely, the leaching of the carbonates from the moraine above the lake level and the precipitation by photosynthesis of the carbonates from the lake water as marl. The first of the processes increases the carbonates while the second reduces it in amount. When a lake is perched high in the moraines, the water is softer than when the level of the lake is much lower than the surrounding moraines. For instance, near the divide between the Faun and Pigeon Rivers lie Center and Loon Lakes on one side, and Fox and Silver Lakes on the other. bonates average respectively 31.92, 24.96, 29.72 and 31.26.

At lower elevations in this same moraine and river valleys lie Long, Garden, and Hogback Lakes on one side and Marsh, Otter and James on the other—whose carbonates average 52.39, 54,73, 44.49, 47.25, 45.96 and 38.00, respectively.

This is illustrated also in the series of lakes whose drainage unites to form the Faun River. The largest lake in one series is James Lake, and in the other is Crooked Lake. Approximately a mile apart they lie, but with a difference in elevation of 23.5 feet (Tucker, 1922, p. 400). The average carbonates for Crooked Lake is 26.37 while that for James is 38.00.

The James series, with their carbonates, consist of Marsh 48.95, Upper Otter 47.45, Lower Otter 41.02, Snow 41.00, James 38.00, Jimerson 36.67.

The Crooked Lake series follows: Center 31.92, Loon 24.96, Crooked 26.87, Gage 30.22. The arithmetical average for the perched lakes, i. e., the Crooked Lake series, is 28.36, while that for the lower lake series is 42.18.

The "softening" of lakes by photosynthesis is the result of the following well known facts. The carbonates in solution in lake water are in the form of the bicarbonate. In photosynthesis the plants not only use the free carbon dioxide in solution, but are also able to use the second radical of the bicarbonate, the so-called "half bound" carbon dioxide. This leaves the normal carbonate which is precipitated as "marl."

In a series of lakes whose difference in level is slight and which are conneted by streams of considerable volume, the amount of carbonate in solution is gradually reduced. This is best illustrated in the series Marsh, Upper Otter, Lower Otter, Snow, James, and Jimerson Lakes cited above.

In other instances variations in leaching caused by variation in the differential between the lake level and the level of the surrounding moraines overbalance the effect of photosynthesis. In the series of lakes which is tributary to the Pigeon River, Pleasant Lake is little below the level of the surrounding land while farther down lies Golden and Hogback surrounded by high moraines. The former has 27.15 cc. carbonates while the latter have 54.73 and 44.49, respectively. Golden is the highest in carbonates of any lake examined in this study.

			SURFACE AND BOTTOM									
_	Lake	Depth		т	(Oz		2 Free	Сь			
1.	Center	5. 5.	23.7 25.	$\frac{18.9}{24.4}$	3.57 5.38	0	.74	6.97 5.68	30.37 30.15	33.86 32.12		
2.	Clear	32.50 30.	22.2 24.2	10.4 10.2	5.71 6.41	.08 1.58	99 -1.23	5.72 4.94	24.40 24.96	28.18 27.18		
3.	Crooked	21. 23.	26.7 22.2	10.6 10.4	5.91 5.5	0.8	0	7.85 1.5	22.93 24.63	28.79 28.11		
4.	Fox	17.5	24.4	10.8	6.2	0	-1.22	5.13	26.42	33.02		
5.	Golden	9.5	26.1	11.7	~5.15	0	3.19	18.45	46.00	63.46		
6.	Gage	21. 21.5	24.4 22.2	10.6 10.6	5.31 5.9	0	99	8.46 5.47	26.64 28.86	39.59 31.39		
7.	George	25. 25.	25.6 23.3	11.1 11.1	6.23 5.7	.1	0	6.47 5.47	27.63 30.60	34.86 33.09		
8.	Hamilton (Fish)	19. 19.	27.2 24.4	11.7 11.7	6.56 7.2	.05	73 -1.23	7.32 9.63	24.40 26.44	29.03 30.39		
9.	Hog	9.	26.6	13.3	6.09	. 34	0	-7.03	27.92	36.54		
10.	Hogback	5.5 8.	24.4 24.4	15.6 13.9	6.03 5.05	0	0	17.25 16.79	40.86 40.17	58.21 48.12		
11.	Jimerson	17.	24.4	10.	5.57	.06	0	5.68	33.61	39.54		
12.	Lake Pleasant.	10.	25.6	14.4	5.57	.21	0	4.54	24.97	28.60		
13.	Long	9.5	24.4.	12.2	5.33	0	.6	5.74	47.72	57.07		
14.	Loon	4.	26.7	21.4	4.76	1.99	.98	3.93	24.10	25.83		
15.	Marsh	11.	25.6	10.	6.73	. 10	0	9.27	50.75	44.16		
16.	(Lower) Otter.	12.	24.8	10.	5.89	.11	- 0	6.92	42.01	40.03		
17.	(Upper) Otter.	10.	25.6	10.6	6.20	.07	0	6.40	50.66	41.27		
18.	Pleasant Lake.	13.	25.9	11.7	5.7	.67	0	5.13	24.40	29.84		
19.	Silver	11.	25.	11.7	5.00	. 10	0	8.17	26.33	36.09		
Dept	h 30 + Clear											

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TABLE No. 2. Summary table for the lakes of Steuben County.

²⁰⁻²⁹ Crooked, Gage, George.

¹⁰⁻¹⁹ Fox, Hamilton, Jimerson, L. Pleasant, L. Otter, U. Otter, Pleasant Lake, Silver.

¹⁰ Center, Golden, Hog, Hogback, Loon.

Birge and Juday (1911, p. 136) have shown that extremely soft water lakes such as those of northeastern Wisconsin are relatively poor in plankton especially phytoplankton. The above mentioned authors divide the lakes of Wisconsin into three classes with reference to carbonates, namely, soft, medium, and hard. The soft water lakes contain carbondioxide as carbonate in amounts less than 5 cc. per liter, the medium 5 cc. to 22 cc. per liter, and the hard water lakes above 22 cc. per liter. On this basis, all lakes considered in this paper are hard water lakes varying in carbonates from 24.96 cc. per liter to 54.73.

Theoretically the amount of phytoplankton should be roughly proportional to the amount of carbonates. Plant growth is also dependent upon other factors. The form of the basin is a potent factor. The shallower lakes generally produce more phytoplankton than the deeper lakes. For example, Hogback Lake with a depth of 8.5 meters has more phytoplankton than any other lake of the series, while Clear Lake of Steuben County, with a depth of 32 meters, is relatively low in phytoplankton.

Rice (1916) and others have shown that the amount and nature of nitrogen compounds are related to plant growth in water. Atkins (1924) has shown a similar relation for phosphorous. Allen (1914) finds some unknown organic compound necessary for the artificial culture of marine plankton.

In spite of these and other factors known to influence plant growth, it appeared probable from the inspection of our data that the number of certain diatoms was correlated with the amount of carbonates.

The average amount of carbonates in thirty-two lakes was determined by taking the arithmetical average of the maximum and minimum. (The volume of most of the lakes is unknown, so that the amount of the carbonates could not be more closely determined.) The coefficient of correlation between this average of the carbonates and the number of three phytoplanktons Fragillaria, Melosira, and Clathrocystis was .4549, .4559, and .0284, respectively.

It appears from this that in spite of other factors influencing plant growth, there is a significant correlation between the carbonates and diatoms, but not between carbonates and blue green algae. Correlations above .3 are usually regarded as significant. These diatom correlation factors are nearer .5 than .4.

OXYGEN

In discussing the distribution of oxygen, it is necessary to recall the thermal stratification during the summer of lakes in temperate latitudes. Due chiefly to thermal resistance to mixture, lakes become stratified during the warmer months into a warm upper layer, beneath which is a stratum whose temperature decreases rapidly as the depth increases, and below this is a region of relatively cold water. These are known respectively as the epilimnion thermocline (mesolimnion) and the hypolimnion. In these lakes the epilimnion is usually five or six meters thick. The thermocline extends from a depth of five or six meters to a depth of ten to twelve meters. The hypolimnion occupies the depth beyond ten or twelve meters. This stratification is usually established by the first of June and lasts until the middle of October in the shallower lakes, and about a month longer in the deeper lakes.

In addition to the thermal stratification of lakes, the amount of oxygen is influenced in the upper levels by photosynthesis which in turn is determined by the amount of incident solar energy and the depth to which the various wave lengths penetrate. The amount of incident energy at the equinox when the sun is at meridian varies with cosine of the latitude. This amount varies diurnally toward zero at sunrise and sunset. The long days of summer at high latitudes tend to offset the influence of the lower angle of incidence.

Birge and Juday (1921) using a thermocouple (bolometer) report that 5% of the sun's energy remains at 5 meters and about 1% at 10 meters. More refined results and very elaborate data are given in a later paper (Birge and Juday, 1929). In sea water Shelford and Gail (1922), using a photoelectric cell, found that about 10% of the light penetrating the surface remained at 10 meters. Klug (1925) using an instrument based on photographic emulsion found that 27% of the light which penetrated the surface remained at 5 meters and that 1.5% persisted at 10 meters. Shelford found 25% of the incident light reflected, Klug 33%.

From the above results it is evident that in our lakes whose transparency approximates that of the Wisconsin lakes, the epilimnion is well lighted and the thermocline receives light sufficient for photosynthesis especially in the upper half. In practically all our lakes the hypolimnion lies below 10 meters. From the results of Birge and Juday 1. c. the hypolimnion never receives as much as one per cent of the incident solar energy.

The Hypolimnion

The hypolimnion is completely sealed from the air during the period of summer stagnation. It is cold and dark. This means that all the oxygen it has is that taken down with the water during the vernal circulation. This amount is gradually reduced. This reduction is due in part to the respiration of the organisms present, but usually the most important factor in its reduction is the decay of organic matter. There is always organic matter on the bottom of the lake. Its decay reduces the oxygen in a thin stratum of water in contact with it.

However, the organisms that live at and near the surface (in the epilimnion) die in large numbers and their remains slowly sink. As they pass through the lower strata of water, they slowly reduce the amount of oxygen. It is obvious that the rate of oxygen reduction depends on two factors, the amount of this organic matter present and the temperature of the water. The temperature of the water depends on the date of stratification. Some lakes stratify earlier than others and the same lake may stratify at different dates in different years.

Of the thirty-two lakes (excluding James and Snow), twelve had no oxygen at the bottom on the date examined. Seventeen others had less than 1 cc. per liter. Of the three that had an excess of 1 cc. per liter, two (Clear of Steuben and Crooked of Whitley County), are the deepest of the series, 32 and 30 meters respectively. Crooked of Whitley is cold on the bottom; its temperature, 6.1° C., is equaled only by Cedar of Whitley. Clear is moderately cold, 10.7° C, but is usually rather free from organic matter. Its littoral is especially free from plants. These two factors account for the persistence to mid-summer of considerable oxygen at the bottom.

Loon Lake on the other hand is the shallowest lake in the series. Its depth is only four meters. On the day the collection was made its surface temperature was 26.7 while the bottom was 21.4.

The temperatures clearly indicate that the lake is mixed to the bottom by the wind during the summer. A period of calm weather would rapidly reduce the oxygen in the lower layers because of the high temperature.

	Lake	Date	s	2	4	6	8
I.	James N	6-19	104	104	105	103	
2. 3.	James J	6-20 6-21	108 105	104 104	106 107	102 101	
1. 5.	James B	6-21 6-22	103	104	103 100.7		
6. 7.	SnowJames A	6-22 6-24	113	111	100.4 121	108	
8. 9.	James J	6-24 6-25	112 109	110 107	116 113	108 103	
[0. [1.	James F	6-25 6-26	106	107 108	113 116	102 110	
12. 13.	James H	6-27 6-28	106	104 108	109	106	
14. 15.	James C	7-1 7-2	115 116	118 116	115 110	107 116	
16.	James U	7-2 7-4			114 101	104	
22.	GageFox.	7-6 7-10	106	106	102	123	158
26. 27.	HamiltonCenter.	7-11 7-14	122	122 101	105		
S. 9.	Clear. U. Otter.	7-15 7-17	107 108	107	110	107	139
0. 12.	L. Otter Hog.	7-18 7-23	106 106	106 102			
14. 15.	Silver	7-24 7-24	103		100		
39. 10.	Crooked Hamilton	7-30 7-31	103 106	103 115	103 103		
1.	MarshGeorge	8-1 8-2	115 108	112 111	105		
1. 5.	GageClear	8-3 8-5					153 134
0.	James G	8-8 8-9	100 102	102 101	104		

 $^{{\}it TABLE~No.~3.}$ Oxygen supersaturations for the year 1929. All except those at 8 meters are in the epilimnion.

The Thermocline (mesolimnion)

The thermocline like the lower levels of the lake (hypolimnion) is sealed from the atmosphere during the period of stagnation but unlike the hypolimnion its temperature varies from that of the epilimnion above to that of the hypolimnion below. It often receives an appreciable amount of light. Its temperature facilitates both more rapid decay of organic material and more

rapid metabolism in the living organism than occurs in the cooler waters beneath it.

The result is that when few chlorophyl bearing organisms are present the oxygen is often reduced more in the thermocline than it is in the upper part of the hypolimnion. This produces what might be called the thermoclinal oxygen notch. It regularly develops in Tippecanoe Lake. In these studies I have found it in station N of James Lake, and in Station O in Snow Lake.

Birge and Juday (1911) report it for lakes North, Green, and Knights. Litynske (1926) found it in Lake Wigvy. Lake Plön and "Schöhsee" according to Thienemann (1928) develop this condition.

This deficiency of oxygen in the thermocline is always subsequent to the establishment of the summer stratification. It usually develops in August and lasts into September. The earliest recorded date I have been able to find is July 12 in Plön, Thienemann (l. c., p. 168). However, in this instance the amount at 15 meters is only .56 cc. per liter less than the amount at 20 meters.

The biological significance of this will be discussed in its relation to the

cisco (Argyrosomus artedi cisco Jordan).

Occasionally a rather dense flora of diatom or algae develops in the thermocline. When this occurs the water may become highly super-saturated. A super-saturation in the thermocline is much more permanent than one developed in the epilimnion because the water of the thermocline is not exposed to the air.

For instance, a super-saturation was found in Otter Lake in 1909 at 4 meters on July 2. This was still present on July 17 and August 13 (Birge and Juday, 1911, Figures 59, 60, 61).

In these lakes Gage had a super-saturation of 158% at 8 M. on July 6. On this date the 5 to 10 meter level had 74,135 Lyngbya per liter. On August 3 the saturation at 8 meters was 153% although the amount of phytoplankton had declined. In Clear Lake the saturation on July 15 was 139% and on August 5 it was 134%. The super-saturation that develops in the thermocline may persist more than a month and for a considerable period after the decline of the plankton flora that produced it as the data in Gage indicated.

In general the oxygen in the thermocline may reach a minimum as low as that of the hypolimnion or it may have a maximum exceeding that of the epilimnion. In either case the condition is very persistent usually lasting until the sinking of the thermocline restores the circulation of the water with that of the epilimnion.

	June	July	August
1929: Hours Mean percent Normal percent	354.3	368.3	299.9
	78.	80.	70.
	67.	70.	66.
1930: Hours. Mean percent. Normal percent.	332.9	351.7	215.1
	74.	77.	50.
	67.	71.	66.
Excess Hours 1929 over 1930.	21.4	16.6	84.8

TABLE No. 4. Sunshine records from the mu aly meterological summary, Ft. Wayne station,

Epilimnion

Oxygen in the epilimnion may change rapidly but rarely does the amount become excessively high or low. This region is influenced by the vicissitudes of the weather as well as the diurnal changes. When considerable phytoplankton is present a calm clear day will result in a super-saturation of oxygen. But a high wind will reduce this to about the saturation point.

Theoretically there should be a diurnal oxygen pulse in the epilimnion on clear days. This is, however, rarely detectable. Birge and Juday (1911, p. 43) found it in Mendota on September 21, 1908. It was demonstrated (Scott, 1923) on Winona Lake August 9, 1922. On Winona Lake it has been impossible to demonstrate this pulse except in very calm and clear weather.

However, even with slight breezes a super-saturation may be built up if there are successive days of sunshine. In 1929 there were 51 series of 0 determination. In these 51 series there were 32 super-saturations in the epilimnion or 62% of the series. In 1930 there were 7 super-saturations in 24 series or 29% of the total.

An increase of the oxygen above the saturation point in the epilimnion can only be accomplished by photosynthesis. This in turn depends on the number of phytoplanktonts and the number of hours of sunshine. The number of phytoplanktonts varied from lake to lake, but there was no appreciable difference between the two years.

The sunshine records were obtained from Fort Wayne. The U.S. Weather Bureau Station at Fort Wayne is the nearest station to this group of lakes. The lakes average about 40 miles from Fort Wayne. They are arranged roughly in an arc from north to north of west.

These data appear in Table No. 3. There was more sunlight in each of the summer months in 1929 than there was in 1930. In 1929 this excess amounted to 21.4 hours, 16.6 hours, and 84.8 hours in June, July, and August. In 1930 most of our work was done in August, the month of the greatest excess. The normal percent of sunshine for August is 66. The mean for August, 1930, was 50 while the mean for August, 1929, was 70. That is, there was approximately 40% more hours of sunlight at Fort Wayne in August, 1929, than there was in 1930.

There is evidence that records obtained at a station in the middle of a city differ from those taken in the open country. There is no evidence that this relation would vary from year to year.

The above data indicate something of the amplitude of seasonal variation in the epilimnion. How much this seasonal variation in photosynthesis and the consequent production of carbohydrates would affect the other life in the lake is unknown. It has been shown (Hjort, 1914 and others) that some marine fishes grow more rapidly one year than another. So far as I know this has not been clearly demonstrated for fresh water fish.

THE PLANKTON

The plankton is one of the most important elements in the economy of a lake and one of the most difficult to evaluate. It has been measured volumetrically, numerically, and gravimetrically. The volumetric and gravimetric methods are relatively rapid, but neither permits analysis of the components of the plankton. Plankton is studied as a mass and not as an association of organisms. The volumetric method also has evell known difficulty arising from the fact that different planktonts settle.

By enumerating the different organisms it is possible to compare their relative abundance in different lakes and to determine their seasonal variations. The difficulty of this method is that neither the weight nor volume of any individual organism of the plankton is accurately known so that the weight or volume of plankton per unit cannot be calculated.

Another difficulty in evaluating plankton is that a few of the forms are probably end products, while many of them are not. The crustacea, especially the cladocera, eat the smaller phytoplankton and in turn are eaten by the fish. The number or amount present at a given time are those that have not been eaten or destroyed in some other way. The value of any organism is not a function of the number present at a given moment, but is a function of the reproductive capacity of this population.

Lake	Number Daphnids sq. M. Max. Depth	Food Available for Number gms. of Fish sq. M.	Pounds of Fish Per Acre Possible
Golden Hogback Long, George Clear.	246,000 52,000	1,442 2,009 2,365 500 346	12,872 17,811 21,049 4,452 3,076

TABLE No. 5. The number of units of fish that the summer daphnid population will support. The first three lakes are especially rich in daphnids and are probably out of balance. The last two are poorer in daphnids and are probably more nearly balanced.

Banta (1921) reared Daphnia in an unbroken line from April, 1912, until September, 1916, nearly four and one-half years. He determined a reproductive factor by dividing the number of young in a brood by the time between broods. In the "minus" line, the reproductive factor was .99 and in his plus line it was 1.08. This means that on the average each parthenogenic adult produced approximately one young per day. If a population remains constant, an amount equally this population will be produced and eaten daily.

While it is not possible to convert any number of Daphnia into gravimetric or volumetric units, it is possible to convert these numbers into fish food requirements by experimental methods. This work was begun by Miss Blanche E. Penrod. By direct observation in an aquarium, she was able to determine the number of daphnids eaten by a blue gill in a given period of time; these periods varied from 15 minutes to one hour. The counts were recorded by a "tallying machine." The work is to be continued, but the results already obtained help in the interpretation of the plankton counts.

In 39 series, blue gills, each weighing 16 grams, ate on an average 139 daphnids per hour. We do not know just how many hours per day a blue gill feeds. If we assume that it feeds for 12 hours a blue gill weighing 16 grams would consume 1668 daphnids, or 104 daphnids per gram of fish.

If this amount is divided into the number of daphnids present in a given column of water (which equals its productive capacity), the quotient represents the number of grams of fish that the daphnids present on that date would support.

In Table 4, this has been computed. Golden, Long, and Hogback Lakes are shallow, rich lakes. George and Clear are relatively deep lakes, not

subject to such rapid changes in temperatures and biota as occur in the shallower lakes. The seasonal changes in daphnid populations are extreme. Especially is this true in shallow, rich lakes. The maxima occur during the spring, summer, or fall, when the fish feed most. The evidence from hatchery plants and from scale studies indicates that fish in inland waters feed little during the colder parts of the year. However, it is hardly likely that a lake would support a fish population indicated by the maximum daphnid population. The average for the warmer months would be a better basis for estimation.

It is also true that blue gills at times feed almost wholly on other organisms. In Wawasee Lake, Hile found them feeding at times almost wholly on chironomid larvae. When the seasonal variations in feeding are worked out, it may be that during daphnid minima, other foods make up the deficit. These questions must await further data.

Another bit of evidence that assists in this evaluation is some data on the contents of fish stomachs. During the studies of Dr. Hile on the fish scales, Mr. E. G. Thomas determined the contents of the stomachs of 412 fish of which 292 were blue gills. Of these blue gills, 138 had eaten daphnids. The work had to be done rapidly. The contents were fractionated and an aliquot part of the daphnids counted. Absolute accuracy was not attained but the results are a fair approximation. Some of the fish contained more daphnids than others. The average number per gram of fish for the 138 fish was 5.5. The maximum for a single fish was 26 daphnids per gram. This indicates that the estimate that daphnids may feed 12 hours per day is too high and consequently the estimate of the number of pounds of fish a lake will support is too low.

The food of the daphnids consists of the smaller forms in the plankton, the so-called nannoplankton. The amount of this that a daphnid requires is a rather difficult problem. The volume of the alimentary canal of Bosmina, Daphnia pulex and Daphnia retrocurva has been determined by making a model to scale and measuring this volume by water displacement. The volumes are .00109 cc., .00287 cc., and .00336 cc., respectively. Some data have been collected on the rate at which food passes through the alimentary tract of these forms. Although 144 readings have been made, some of the results are rather erratic. Consequently, they are withheld until the factors causing the variations are determined. It is hoped that this work will add one more link in the "food chains" in our lakes.

JAMES LAKE—ITS PECULIARITIES

James Lake has the most complex basin of any lake whose map or description I have been able to secure. It has three major basins designated first, second, and third, beginning at the south. Snow Lake, lying to the north of the third basin, is really a fourth basin of Lake James, although the channel connecting the third basin and Snow Lake is longer, narrower, and shallower than the channels connecting the other basins. These four basins lie in a great crescent with the convex side to the west (see map). The first and second basins are connected by a channel 800 feet (242 M.) wide and 27 feet (8.2 M.) deep. The channel connecting the second and third basin is 500 feet (152 M.) wide and 30 feet (9.1 M.) deep.

These four primary basins have twenty-one secondary basins or deeps distributed as follows. The first basin has eight, the second five, the third three, the fourth (Snow) five. These secondary basins differ from each other physically, chemically, and biologically. In Table 6 I have selected five pairs that have the same depth. The bottom temperatures of the basins having the same depth differ from 5 degrees C. in basins N and O to 2.8 degrees in basins E and K. This indicates that the basins stratify on different dates. Those with the colder water at the same depth stratify first.

Two factors influence the rate at which oxygen is depleted from the bottom. The higher the temperature and the more organic matter present, the more rapidly the oxygen is reduced. In the pairs CU, BJ, and NO, the temperature is the more potent factor. In the basins GP and EK, the oxygen is lowest at the bottom in the basin of each pair that has the lowest temperature indicating that more organic matter or more easily oxidized material is present in the basin with the minimum temperature.

Date	Station	D	Т	О	CO ₂	Cb
6-24	GPEKCUB JNO	15 15 17 17 18 18 20 20 25 25	13.1 10.6 12.8 10. 11.7 10.0 11.7 9.2 6.7 7.2	3.1 0 2.7 1.3 1.5 4.1 2.0 2.6 2.3	3.8 7.50 2.84 7.52 4.90 4.12 1.38 1.64 3.52 7.70	35.78 38.42 38.28 31.82 39.30 38.78 39.18 38.42 38.92 42.42

TABLE 6. Comparison of Stations of the same depth in James Lake.

PLANKTON

Species	Sta.	0-5	5-10	10-15	15-20
Ceratium	N B	2,448 1,105	332 298	284 76	93
Dinobryum	N B	19,051 3,357	288 439	136 149	21 51
Daphnia	N B	4.5 8.	8.8	8.8	12.8
Holopedium	N B	113 0			
Diaptomus	N B	12 8.8	84 4.8	0 14.4	10.4
Cyclops	N B	13 21.6	64 3.2	7.2	5 5.6
Nauplii	N B	19 42	64 29	4	29.6
Melosira	N B	7,597 422	51	231 119	217 294
Fragillaria	N B	9,525 849	5,040 772	1,752 1,186	1,203 2,709
Clathrocyctis	N B	11,680 1,809	204 430	221	264

DISSOLVED GASES

D		т	0	%	co	Сь
S	N B	24.4 24.2	6.1 6.0	104 103	25	19.98 18.70
20	N B	7.3	4.8		1.76	19.46 19.59

N-Depth 25 M.-date 6-19-29 B-Depth 20 M.-date 6-21-29

TABLE No. 7. Comparison of Stations N and B James Lake.

LAKE: JAMES, STATIONS E AND U Date: 7-2-1929—Aug. 1-18 M.

Species	E	U
Ceratium	1,194	610
Dinobryum	8	74
Aneura	52	35
Polyarthra	13	11
Notholea	20	9
Daphnia	1.7	3.7
Diaptomus	18	14
Cyclops	19	13
Nauplii	19	13
Melosira	210	158
Fragillaria	4,222	3,011
Asterionella	722	389
Anabena	4	
Clathrocyctis	56	37
Lyngbya	194	483

DISSOLVED GASES										
Temp	erature	Oxygen								
E U		Е	U							
22.2	22.1	7.1								
22.2	21.7	7.0								
22.2	21.1	7.1	7.1							
18.9	16.4	7.0	7.07							
14.7	13.9	6.8	6.7							
13.7	12.8	5.7	6.2							
13.3	11.1	4.3	5.5							
13.1	10.2	3.7	4.3							
12.8	10.	2.7	4.1							
	Temp E 22.2 22.2 22.2 18.9 14.7 13.3 13.1	Temperature E	Temperature Oxy E U E 22.2 22.1 7.1 22.2.2 21.7 7.0 22.2.1 7.1 18.9 16.4 7.0 14.7 13.9 6.8 13.7 13.3 11.1 4.3 13.1 10.2 3.7							

TABLE 8. Comparison of collections taken at stations of the same depth on the same date.

Not only do these basins differ in temperature and the distribution of gases, but the planton is different. In Table 7 Stations N and B are compared. From the bottom temperatures, it is evident that Station N stratified later than Station B. Correlaed with this is a much richer plankton in the former than in the latter. At Station N, Ceratium, Dinobryum, Melosira, Fragillaria, and Clathrocystus are strikingly more numerous than at Station B.

There are 113 Holopedium per liter at N, while it is entirely absent from Station B.

There are two days difference in the dates of the collections at these two stations.

The collections at Stations E and U were made on August 18. The differences here are quite apparent.

Ceratium, the rotifers, and all the phytoplankton were more numerous at ${\bf E}$ than U, while the reverse was true of Dinobryum and Daphnia.

In this case, as in Stations B and N, the station that had stratified later as indicated by the higher bottom temperature had developed the more plankton.

The epilimnion beyond the littoral is usually regarded as a rather homogeneous association. It appears from these data that it is homogeneous only because the thermocline and hypolimnion beneath it are homogeneous. Where these lower depths are separated by barriers they develop different characteristics. They differ in temperature, in oxygen, in carbonates, and probably in organic matter.

It seems apparent that the lower levels of a lake have a much more intimate relation and direct influence on the epilimnion during the summer stratification than has heretofore been suspected.

I first noted differences in temperature and dissolved gases in the different secondary basin of Webster Lake (Scott, 1916, p. 17). Welch (1927) has noted marked differences in the physical and chemical characteristics of the seven secondary basins of Douglas Lake.

The next problem is the analysis of the biological peculiarities of each basin and their relation to the physical and chemical characteristics of the basin. What influence one basin may have on another is entirely unknown.

RELATION OF DISSOLVED OXYGEN AND CISCO

Early in September, usually between the first and tenth, the "cisco" (Argyrosomus artedi cisco Jordan) come to the surface of Snow Lake, struggle as if in discomfort, and then disappear. They have been described by local observers as "gasping for breath." When they begin to appear a maximum is soon reached, after which the number at the surface is rapidly reduced. The maximum rarely lasts more than a day and the whole phenomenon is over in less than a week. This has been observed on Snow Lake for at least thirty years. It occurs occasionally on the third basin of James Lake.

They have been examined repeatedly for parasites without success. I suspected that the disappearance of the oxygen from the hypolimnion

might be the cause.

In the fall of 1928 cisco were taken from Indian Village Lake, a small lake about four miles southeast of Lake Wawasee (Turkey Lake). A preliminary set of soundings indicated that its maximum depth was near six meters. It was possible that cisco taken in Indian Village Lake in November during the breeding "run" might have come from lakes farther up the chain. There are six lakes in the so-called Indian Village chain.

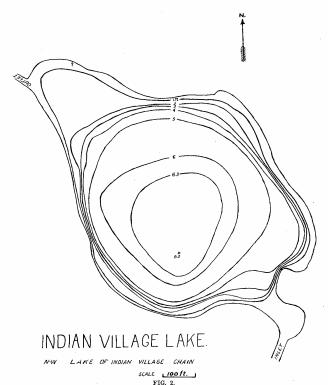
In 1929 a map was made of Indian Village Lake and the oxygen, carbonates, and temperature determined. The maximum depth was 6.4 meters. Only a trace of oxygen was found below 4 meters. Dr. Ralph Hile then set a 12 foot gill net in the deeper part of the lake, and took fish in the upper 2 feet only of the net.

The fish never appear at the surface except at the breeding "run" in November.

Tippecanoe Lake develops an oxygen "notch" in the thermocline, but the oxygen in the hypolimnion is rarely, if ever, reduced to a level dangerous to the "cisco."

The evidence from Indian Village Lake indicates that the mere disappearance of the oxygen from the hypolimnion causes no discomfort if the oxygen curve maintains a simple sigmoid form. The development of a thermoclinal notch in the oxygen curve is not in itself dangerous. However, if there is a thermoclinal notch developed in the oxygen curve and subsequently the oxygen is exhaused from the lower hypolimnion, the fish will be forced upward by the latter process until they reach the lower part of the thermocline. From this level they move into a region of less oxygen by going either up or down. They are trapped and remain at this level until they approach asphyxia. When they lose control of their hydrostatic apparatus, they float

toward the surface. When this occurs in Snow Lake, they have 3 meters above them with little or no oxygen. This increases their discomfort. Although there is much oxygen in the upper 7 meters the fish float to the surface before they make a complete recovery.



In Figure 3, the curve for Tippecanoe Lake has an oxygen notch with plenty of oxygen remaining in the hypolimnion. The curve for Indian Village Lake is a simple sigmoid curve. The curve for Snow Lake dated 9-7-30 shows the notch developed. In the curve for 9-14-29, the water is near oxygen saturation for the first 7 meters. At 8 meters there is approximately one-half as

much as at 7. At 9, 10, and 11 meters there is no oxygen but at 12 meters it appears again. This is the point just below the thermoclinal notch. So far high winds have prevented quantitative collections to demonstrate the accumulation of fish just below the thermoclinal notch. After they disappear from the surface they remain in the epilimnion. This has been demonstrated by netting. The other facts connected with this suggestion are well established.

For many years the fish have been gathered with dipnets in Snow Lake during the time when they come to the surface. With hand propelled craft they seem to have held their own. However, the increased us of the outboard motor has resulted in nearly every fish that reaches the surface during daylight hours being captured. The catch in 1929 and in 1930 is reported to be much below the normal. The present regulation should probably be modified in order that sufficient stock be preserved for breeding.

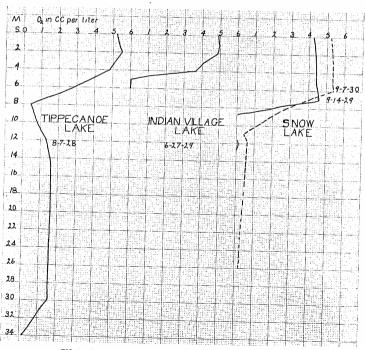


FIG. 3. Oxygen curves for Tippecanoe, Indian Village, and Snow Lakes.

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EXPLANATION OF TABLES

The figures 0.5, 5-10, 10-15, and 15-20 are depth in meters. D—Depth. T—Temperature. O—Oxygen. %—Percent of saturation. CO2—Carbon-dioxide. Cb—Carbonates.

TABLE 9.

LAKE: ADAMS (LaGrange) Date: 9/6/30

Plankton

	Pl	ankton						Di	ssolved	Gases		
Species	0-5	5-10	10-1	5 15-20)	D	т	0	%	CO ₂	СР	рН
Ceratium	519	110	17	4		s	22.7	6.52	100	-1.4	25.4	8.3
Dinobryum		4				2	22.4	5.48		-1.6	25.4	8.3
Aneura	59	21	4	8		4	22.3	5.27	ŀ	-2.2	1	-
Polyarthra Asplanena Noltholea	12	4		4		6	21.1	4.41		-1.0	26.2 26.0	l
l .			.8	4		8	13.	.12		1.4	33.0	
Daphnia	4.8	.8	3.2			10	10.3	.17		1.6	33.2	
	1	1			П	12	9.7	.07		1.6	32.0	
Diaptomus	13.6	3.2	1.6	1		15	8.9	.06		1.4	32.4	
Cyclops	20.8	10.4	2.4	1.6	1	1			į			
Nauplii	12.8	10.4	1			20	8.8	0	ı	2		
Corethra	1	.8		i			0.0	١		2	32.8	
Melosira	115	46	17	4		- 1		- 1	ļ		j	
Fragillaria	554	64	81	21		25	8.8	0	İ	3.2	33.0	
Asterionella									- 1	- 1	- 1	
Anabena	353	76	4	4		ł	- 1		- 1	ł		1
Clathrocyctis	2,197	806	174	307	- 1	- 1				į		
Oscillatoria	1,216	401	123	128	- [1				
Lyngbya	12						- 1			1		
		!										

TABLE 10.

LAKE: BIG CEDAR (LaGrange) Date: 9/2/30

Plankton

	I lenk											
Species	0-5	5-8	10-15	15-20		D	т	0	%	CO ₂	Сь	pН
Ceratium	1,055	307				s	24.4	5.33		-1.4	31.6	8.3
Dinobryum	465	128		ļ		2	24.4	5.88	101	-2.4	31.8	8.2
Aneura	64	64-				4	23.8	5.93	191	-2.0	32.4	8.1
Polyarthra	17					6	22.0	2.75		0	33.4	7.6
Noltholea	4.2			ļ		8	21.1	.12		0	34.8	7.5
Daphnia	1.6	10										
Ostracoda		8.8						-				
Diaptomus	20	12										
Cyclops	28	6.4		ļ								
Nauplii	30	11.2			1							
Melosira	8	4				ĺ						
Fragillaria	3,878	2,235				1	ļ		ľ			
Asterionella	4		1									
Anabena	46					ļ						
Clathrocyctis	2,073	1,024			ĺ					1		
Oscillatoria	21	21	1						1			
Lyngbya				L			j				<u> </u>	

TABLE 11. LAKE: BIG CEDAR (Whitley) Date: 8/12/30

-	Plankt	on					Di	ssolved	Gases		
Species	0-5	5-10	10-1	15-20		D	Т	0	%	CO2	Сь
Ceratium	-1-	8.5		12.8		s	26.1	5.38		-1.4	28.8
Dinobryum	-	4.2	-		1	2	25	5.35		-1.4	29.2
Aneura Noltholca Polyarthra	1	12.8	4.2		1	4	24.4	5.69		-1.0	28.2
Asplanena Hexarthra	8.5 4.2	4.2			1	6	17.7	6.71	l	-1.4	29.2
Daphnia	1	1	8.5	12.8		8	13.3	7.10		-1.4	31.8
Dapnina	2.4	10.4	15	28.8	l	10	10.3	5.97		-1.0	31.8
		"			1	12	8.8	4.57		.4	32.0
D: .	i		ł		ł	14	7.2	2.90		2.0	31.6
Diaptomus	5.6	16	.8					j			
Cyclops	3.2	14.4	14.4	11.2				' I		1 1	- 1
Nauplii	17	46.9	76	81	i i					ļ j	1
Corethra		21	4.2			21.5	6.1	40		2,0	31.6
Melosira		4.2					1	1			
Fragillaria	25	25	64	110			ł	İ			
Asterionella		12.8	59	42	1	1	1	j			- 1
Anabena	68	136	29	29	- 1			Ì		- 1	ł
Clathrocyctis	- 21	298	89	153	i		- 1				
Oscillatoria	l	8.5	4			- 1	- 1		j	-	
Lyngbya	12.7	119	21	12							

TABLE 12. LAKE: CENTER Date: 7/14/29

Plankton

Species	0-5	5-10	10-15	15-20	D	т	0	%	CO ₂	Сь
Ceratium	29				s	25	5.48		74	30.1
Dinobryum					2	25	5.85	101	74	29.9
Aneura	145				4 5	24.7 24.4	.55 0		4.20 5.78	31.1 32.1
Polyarthra Asplanena Hexarthra	42 12									
Daphnia Bosmina Ostracod	72 .8									
Diaptomus					1					
Cyclops	96									
Nauplii	72									
Corethra	.8							ĺ		
Melosira	768									
Fragillaria Tabellaria Asterionella	68 12									
Anabena	51								İ	
Clathrocyctis	1,211									١.
Oscillatoria	665								İ	
Lyngbya	1,715									

TABLE 13. LAKE: CENTER Date: 8/3/29

Plankton

0					,		Dis	solved	Gases		
Species	0-5	5-10	10-15	15-20		D	т	0	%	CO ₂	Сь
Ceratium	196										CB
Dinobryum	435					1	23.3 23.3	3.85 3.79		0	30.36
Aneura Hexarthra Polyarthra	64 106					S 1 2 3 4 5	23.3 22.8 20.3 18.9	3.74 4.05 0		0	31.36 30.12 30.36 31.62
Noltholca Asplanena	119			- 1			10.9	0		6.96	31.62 33.96
Daphnia	2.4				- 1		1	1	- 1		
Bosmina Ostracod	110 8.8										
Diaptomus	2.4	- 1	1					- 1			
Cyclops	208				- [- 1	- 1		1	
Nauplii	123										
Melosira	580						l				
Fragillaria	537		- 1				- 1		- 1		
Asterionella	17	- 1	- 1		}	- 1	- 1		- 1	- 1	
Anabena	38		- 1	- 1					- 1		ı
Clathrocyctis	1,111		- }	ĺ			- 1		-	1	
Oscillatoria	533			- 1							1
Lyngbya								İ			

TABLE 14.

LAKE: CROOKED (Steuben) Date: 7/5/29

Plankton

Species	0-5	5-10	10-15	15-20	D	т	0	%	CO2	Съ
Ceratium	780	243	21	25	s	22.2	5.5		0	24.62
Dinobryum	55	21	4		2	22.2	5.5		0	24.14
Aneura	12.8	21		8.5	4	21.7	5.6		0	24.14
Polyarthra					6	18.3	5.0		0	24.88
Noltholea Asplanena	8.5 12.8	8	8.5 8.5		8	15.6	2.0		3.72	27.86
Hexarthra Daphnia	17 14	8	1.6	4	10	13.1	2.1		3.72	27.86
Ostracod	4.2				12	11.5	2.9	l	3.98	28.36
					15	10.4	2.1		3.98	27.86
Diaptomus	35	.8	.8							
Cyclops	8	4.8	.8	11		ļ.				
Nauplii	29	17	4.2	4	20	10.6	1.4		4.86	27.86
	72	243	192	862	23	10.4	.84		5.22	28.10
Melosira			1	1		ļ				
Fragillaria	315	119	81	25					}	
Asterionella	76	29	12	4			1			
Anabena										
Clathrocyctis	524	311	55	162						-
Oscillatoria	8	72	21	29						
Lyngbya										

TABLE 15.

LAKE: CROOKED (Whitley)

Date: 7/30/29 Plankton Dissolved Gases Species 0-5 10-15 5-10 15-20 D т o % CO₂ Съ Ceratium 692 217 17 42 \mathbf{s} 26.7 Dinobryum 5.84 103 4 22.92 2 26.1 5.89 103 Aneura 0 22.44 4.2 Polyarthra Noltholca Asplancna Hexarthra Daphnia 4 23.9 6.11 103 23.42 34 6 21.1 4.44 2.44 23.18 5 8 8 4 8 16.7 3 .30 6.82 27.56 2.4 3.2 10 13.3 .61 5.02 28.54 12 11.7 1.33 4.88 26.84 Diaptomus 15 16 3 10.9 2.4 .87 6.34 27.56 Cyclops 1.6 7 2.4 3.8 Nauplii 4 8 4.2 4.2 $^{20}_{21}$ 10.6 10.6 0 Corethra 7.80 28.78 5.84 28.78 18 Melosira 34 64 140 128 Fragillaria 516 166 51 Asterionella 85 136 51 4 Anabena Clathrocyctis 866 507 264 183 Oscillatoria 162 42 29 34 Lyngbya

TABLE 16.

LAKE: CROOKED (Whitley) Date: 8/15/30

Plankton

0-5	5-10	10-30	15-30		D	T	0	%	CO2	Cb
55	42	4			s	26.1	5.56		-1.4	25.8
8	1				2	25	5.54		-1.0	25.8
		166			4	24.4	5.28		-1.0	25.8
102	i	46			6	21.6	5.28		-1.6	25.8
	12.8	17			8	13.5	5.15		-1.0	25.2
.8	2.4	1.6			10	10	8.40	108	-1.4	29.0
4	4	.8			12	8.5	7.29		-1.0	29.2
										29.2
21	16	9.6			15	7.5	4.76		U	29.2
22	12	29.6						ŀ		
11.2	2	61			20	6.6	4.0		1.0	.27.2
ĺ			1					Ì		
	4.2	1					0.00			29.6
8.5	4.2				25	6.1	3.23		1.0	29.6
İ							İ		İ	
			1		30	6.1	1.63		2.4	23.6
785	1,147	354								
64	29	13								
	55 8 102 .8 4 21 22 11.2	55 42 8 102 12.8 .8 2.4 4 4 21 16 22 12 11.2 2 8.5 4.2 785 1,147	55 42 4 8 166 102 46 1.8 17 .8 2.4 1.6 4 4 .8 21 16 9.6 22 12 29.6 11.2 2 61 4.2 8.5 4.2	55 42 4 8 166 102 46 17 .8 2.4 1.6 4 4 .8 21 16 9.6 22 12 29.6 11.2 2 61 4.2 8.5 4.2 785 1,147 354	55 42 4 8 166 102 46 17 .8 17 .8 2.4 1.6 4 4 .8 21 16 9.6 22 12 29.6 11.2 2 61 4.2 8.5 4.2 785 1,147 354	55 42 4 8 8 8 166 4 102 46 6 12.8 17 8 .8 2.4 1.6 10 4 4 .8 12 21 16 9.6 22 12 29.6 11.2 2 61 20 4.2 8.5 4.2 25 785 1,147 354	55 42 4 S 26.1 8 166 4 24.4 102 46 6 21.6 12.8 17 8 13.5 .8 2.4 1.6 10 10 4 4 .8 12 8.5 21 16 9.6 15 7.5 22 12 29.6 11.2 20 6.6 11.2 2 61 20 6.6 8.5 4.2 25 6.1 785 1,147 354 30 6.1	55 42 4 S 26.1 5.56 8 166 4 24.4 5.28 102 46 6 21.6 5.28 12.8 17 8 13.5 5.15 .8 2.4 1.6 10 10 8.40 4 4 .8 12 8.5 7.29 21 16 9.6 15 7.5 4.76 22 12 29.6 20 6.6 4.0 11.2 2 61 20 6.6 4.0 8.5 4.2 25 6.1 3.23 785 1,147 354 30 6.1 1.63	55 42 4 S 26.1 5.56 8 166 4 24.4 5.28 102 46 6 21.6 5.28 12.8 17 8 13.5 5.15 .8 2.4 1.6 10 10 8.40 4 4 .8 12 8.5 7.29 21 16 9.6 15 7.5 4.76 22 12 29.6 11.2 2 6.6 4.0 4.2 25 6.1 3.23 785 1,147,354 30 6.1 1.63	55 42 4 8 26.1 5.56 —1.4 8 166 4 24.4 5.28 —1.0 102 46 6 21.6 5.28 —1.6 1.2.8 17 8 13.5 5.15 —1.0 1.8 2.4 1.6 10 10 8.40 108 —1.4 4 4 8 12 8.5 7.29 —1.0 11 5 7.5 4.76 0 0 0 22 12 29.6 11 20 6.6 4.0 1.0 8.5 4.2 4.2 25 6.1 3.23 1.0 785 1,147 354 30 6.1 1.63 2.4

TABLE 17. LAKE: CLEAR (Steuben) Date: 7/15/29

ankton			

							D	ssolved	Gases		
Species	0-5	5-10	10-1	5 15-20		D	т	0	-%	CO2	Сь
Ceratium	965	596	34	17	1	s	24.2	6.37	107	-	-
Dinobryum	64	25			1	2	23.7	6.51	1	.02	
Aneura	9.6	3.2	3.2	4	1	4	23.3	J	107	.98	24.46
Polyarthra Noltholca	1		.8	1.6	1	6	21.1	6.56	110	.98	24.98
Triarthra			3.2	1.6	1	8	1	6.57	107		24.70
Daphnia	2.4	2.4	ſ	1	1	1	15.2	9.65	139	1.72	24.18
Holopedium	1.6	.8	1			10	12.7	5.79		1.62	27.18
		"		1		12	11.7	4.16		2.96	26.92
Diaptomus	20	10	14	13.6	1	15	11.1	3.30		2.70	27.98
Cyclops	26	18	6	2.4	1 1						
Nauplii	56	28	2.4	7.2		20	10.6	2.77		2.94	
										2.94	27.42
Melosira	328	3,672	132	114	' I	1		i		ł	ĺ
Fragillaria	1				- 1	25	10.6	2.48	1	2.94	26.68
Asterionella.			1			ŀ			- 1		
Anabena	1				- 1	30					
Clathrocyctis	2,406	529	104	136	- 1	32		1.65		2.94	27.18
Oscillatoria	64		4	100	- j	32	10.2		- 1	- 1	
Lyngbya			-	- 1	-].			-		ı	
		!								- 1	1

TABLE 18. LAKE: CLEAR Date: 8/5/29

Plankton

Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO ₂	Cb
Ceratium	320	72	25	8		s	22.2	5.65		98	24.40
Dinobryum	4					2	22.2	5.82		98	23.90
Aneura	76	32	21	17		4	22.	5.88		74	24.40
Polyarthra			4			6	21.7	5.79	ĺ	74	24.14
Noltholea	.8			4		8	14.7	9.38	134	-1.74	26.38
Daphnia	1.6	4	1.6	3.2		, 10	12.5	4.25	ļ	2.98	27.38
	ļ			1	· ·	12	11.7	2.44		3.48	27.62
Diaptomus	2.4	16.8	15	8.8		15	10.9	1.60		4.22	28.38
Cyclops	6.4	10.4	5.6	5.6							
Nauplii	16.8	10.2	11	5.6		20	10.6	1.19		4.72	27.38
Melosira	68	12	46	128							
Fragillaria	46	17	17	12		25	1.6	.70		4.98	28.62
Asterionella											1
Anabena	106	25	8				ŀ				
Clathrocyctis	3,200	473	273	93		30		.08		5.72	28.18
Oscillatoria	153	136	102	68		32	10.4				
Lyngbya	537	1,036	209								

TABLE 19. LAKE: FOX Date: 7/10/29

Plankton

		ian	kton			,	- /	n	tana a			
Species	0.	-5	5-10	10-15	15-20	T	Ţ	_	rssorvec	I Gases		
Ceratium	89	 1	234		10-20		D	T	0	%	CO ₂	Cb
Dinobryum		3.5	8	145			s	24.4	6.2	106	1.22	00 4
Aneura	12						2	24.2	6.2	106	1	26.4 25.9:
Polyarthra Asplanena	25			1 1			4	21.9	6.2	102	1 .	25.6
1	25	-	12.8	4.2	- 1		6	15.0	8.6	123	()	39.28
Daphnia	4	.	4.8	5.6		- 1	8 10	12.8	1.8	Ι.	1 1	31.06
							10	11.1	.32		6.84	2.28
Diaptomus	20	-				- 1			0		7.32	2.52
Cyclops	8	1		2.4			15	11.1	0	- 1	6.10 3	3.12
Nauplii	25			.8			17.5	10.8	0	- 1	- 1	
Corethra		19	12				- 1			- 1	3.12 3	3.12
Melosira	51	1	2	8	- 1				- 1			
Fragillaria	17	8	5 3	49					- 1	- 1		
Asterionella Anabena	4		4	17			- 1					
Hathrocyctis	102		- 1	4				1				- 1
scillatoria	1,262	550	122	- 1					-			- 1
yngbya	31,091	256		8			1					
	51,001											

TABLE 20.

LAKE: GAGE Date: 7/6/29

Plankton

Species	0-5	5-10	10-15	15-20		D	т	0	%	CO2	Сь
Ceratium	477	128	140	46	١.	s	22.2	5.9		.98	28.86
Dinobryum	1,710	46	499	72		2	22.2	5.9		.48	28.60
Aneura	8 29	38	42 17	4.2		4	20.9	6.1		.48	28.60
Hexarthra Polyarthra		4.2		17		6	20.6	6.0		.48	28.60
NoItholea Asplanena	25 21	42	34	4.2		8	14.4	11.2	158	2.98	28.86
Daphnia	13	5.6	.8	.8		10	12.5	4.3		2.48	29.34
Bosmina	1.6					12	11.5	4.0		4.96	30.34
		ļ	ł	1		15	10.9	.03		4.46	31.48
Diaptomus	36	4.8	1.6			15	10.9	.03		4.40	01.40
Cyclops	16	24	3.2	1.6			İ				
Nauplii	55	12.8	4			21.5	10.6	0		5.46	31.48
Corethra		1.6	.8			21.5	10.0	0		0.40	31.43
Melosira	157	4	55	25							
Fragillaria	857	170	392	157							
Asterionella	106	ļ	17	4.2							
Anabena	42	12									
Clathrocyctis	1,608	302	226	38							
Oscillatoria											
Lyngbya	1,220	74,133	1,933	200							

TABLE 21.

LAKE: GAGE Date: 8/3/29

Plankton

								solved	Gases			
Species	0-5	5-10	10-18	15-20		D	Т	0	%	CO2	Cb	
Ceratium		153.6	51	51		s	24.4	5.31		0	26.64	
Dinobryum	-	332.8	332	92		2	24.4	5.16	ł	0	27.63	j
Aneura		45	10	15		4	23.9	5.17		0	26.89	
Polyarthra						6	20.4	5.05		0	27.39	l
Noltholca	1 1	81.9	20	5		8	15	10.64	153	-1.24	i	l
Daphnia		7.6	ł			10	12.8	1.31		3.98	29.88	l
Asplanena	1 1	35				12	11.7	.27		5.00	30.37	
Diaptomus		.9		.9		15	11.1	0		4.98	30.87	
Cyclops		4.8	8	.9								ĺ
Nauplii		29.4	5	.9			ij					i
Corethra	1	2	5			21	10.6	0		8.46	39.54	
Melosira	2	225	122	9.2		1	ĺ			- 1		
Fragillaria		40	5	20	- 1	ł	ł	ĺ		.		
Asterionella	1 1	35		j	1	- 1		- 1	- 1			
Anabena		5						1	ł			
Clathrocyctis		97	302	97	Ì	- 1					[
Oscillatoria				5			ľ					
Lyngbya	4	3,950	936	424.9			ĺ		- 1			

TABLE 22.

LAKE: GEORGE Date: 7/8/29

Plankton

Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO2	Сь
Ceratium	2,056	413	59	8		s	23.35	5.7			30.60
Dinobryum	93	17	4	1		2	23.1	5.7			28.86
Aneura Noltholca	8.5	4.2 8.5				4	23.0	5.7			28.60
Polyarthra Asplanena	8.5	8.5				6	21.1	5.4			29.34
Hexarthra	34	4.2				8	15.9	4.2		1.76	31.94
Daphnia	1.6	9.6	23	6		10	13.9	4.1		3.22	32.34
	1					12	12.5	3.2		2.72	30.60
Diaptomus	17	12	3			15	12.0	2.0		5.96	33.32
Cyclops	3.2	2.4	4.8	2	ĺ					ŀ	١.
Nauplii	34	8	17	3		20	11.1	1.2		4.26	33.32
Corethra		1									
Melosira	55	25	85	64							
Fragillaria	1,373	149	136	17		25	11.1	.93		5.46	33.08
Asterionella	34	8	29.8	4				İ			
Anabena								ł			i
Clathrocyctis	469	597	213	123							
Oscillatoria	110	51	21	17			İ	1			
Lyngbya Spir	21	8	8								

TABLE 23.

LAKE: GEORGE
Date: 8/2/29

	Pia	nkton					D	issolved	Gases			
Species	0-5	5-10	10-1	5 15-20		D	Т	0	1 %	Co	2 Ch	-
Ceratium	341	42	12.8	34		s	25.6	1	-			_
Dinobryum	29	1			1	2	1	6.22	108	0	27.6	2
Aneura	28	59	2.4	.	1		25.4	6.36	111	0	27.38	3
Polyarthra	2	1.6	1	1-		4	25.4	6.02	105	0	28.12	2
		1		1 1		6	21.7	5.21		0	28.88	,
Daphnia	.8	2.4	1.6	1 !		8	17	1.45		3.98	30.86	1
		2.4	1.6	5.6	- 1	10	13.9	2.01		4.22	31.86	1
Holopedium	.8		-			12	12.5	1.62		5.98	32.36	-1
Diaptomus	4.8	11.2	.8	4		15	11.7	.41		5.98	33.00	1
Cyclops	6.4	13.5	3.2	4.8	- 1		1 1			0.00	33.00	l
Nauplii	16		2.4	4	- 1			1				l
Corethra	1	1 1	.8	1		20	11.1	.06		6.72	33.36	
Melosira	1		.0				'					
Fragillaria	1,211	281	133	93		25	11.1	.10				
Asterionella				90		- 1		. 10	- [6.42	34.86	
Anabena	1 1	- 1	1		- 1	1			- 1	-		
Clathrocyctis	859	1,156 1	.830 2		1	- 1	.		-			
Oscillatoria		-, 100	,000	204		- 1			- 1		İ	
Lyngbya												
											- 1	

TABLE 24.

LAKE: GOLDEN Date: 7/25/29

Plankton

							21.	sorved v	Gaoto		
Species	0-5	5-10	10-15	15-20		D	т	0	%	CO2	Сь
Ceratium	891	153.6				s	26.1	5.07		3.18	46.0
Dinobryum	46	93				2	23.9	4.92		4.42	48.6
Aneura	81	17				4	18.9	.89		13.28	46.74
Polyarthra Noltholca Asplanena	123	8 4				6	13.7	.09		13.76	48.70
Hexarthra Daphnia	123 85 34 25	5				9.5	11.7	0		18.44	63.46
Diaptomus	3										
Cyclops	16	١.,			ı				!		
Nauplii	48	8		j							
Pediastrum Melosira	8.5 3,784	878									
Fragillaria	6,417	768	i		ſ						
Asterionella	9,975	2,551		- 1							
Anabena			ĺ			- 1		- 1			i
Clathrocyctis	405	145			-	1	1				
Oscillatoria	1,331	29	ļ								
Lyngbya	550	102	1		-	j					

TABLE 25.

LAKE: HAMILTON Date: 7/11/29

Plankton

								D	issolved	Gases		
Species	0-	5	5-10	10-15	15-19		D	T	10	_	7	_
Ceratium	729		64	25	-	-	-	<u> </u>		%	CO ₂	Сь
Dinobryum	51	- 1	4	25	17	1	s	24.4	7.1	122	1.22	26.4
Aneura Hexarthra	85		17	4	1	1 .	2	24.4	7.1	122	.98	25.2
Polyarthra Noltholca	46.9	1	.	*		1 1	4	23.1	6.3	105	.48	25.9
Asplanena Triarthra	42	11	4 7		-00	1 1	6	18.9	4.3		.98	27.1
Daphnia	4. 7.	2 1	4	6	29		. 8	14.4	1.42		5.18	28.66
Pediastrum	1. "		8.5	۰	8.8		10	13.6	1.28		6.92	29.64
					- 1		12	13.3	1.20		6.92	29.64
Diaptomus	28	1.	1.8		.	- 1	15	12.5	.7			
Cyclops	2	12	- 1	13					- '	- 1	6.16	29.64
Nauplii	123	49	- 1		15	- 1	19	11.7	.0			
	1.	1		- 1	10		- 1	- 1		- 1	9.62	30.38
Melosira	209	243	19	2 /	34					i		
Fragillaria	4,501	823	46	,	- 1	- 1	- 1				i	
Asterionella	307	72		4	Ŭ	- 1					- 1	
Anabena	273	4		1.		1.	- 1			- 1		
	3,426	964	354	1 21	,	1:						
Osoillatoria	42	8	21	1		1.	1					
Lyngbya					- 1	1.					- 1	
					ᆜ.	1						

TABLE 26. LAKE: HAMILTON

Dissolved Gases

Date: 7/31/29

	Plankton										
Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO ₂	Cb
Ceratium	174	25	4.6	12		s	27.2	6.48	116	72	24.40
	2.8				ļ	2	26.9	6.47	115	48	23.42
Dinobryum	2.0				ļ	4	23.9	6.08	103	0	24.4
Aneura				1		6	20	2.74	1	2.68	26.58
Polyarthra				4.6			1	.31	i	5.60	28.78
						8	15.4	1	1	8.28	29.76
Daphnia pulex	1	4		1.6		10	13.9	.31	i	1	1
D. retrocurva	28	ĺ			!	12	13.3	.06		6.40	30.00
:						15	12.8	0	ļ	7.32	29.02
Diaptomus	4		5.6			10	12.0	-	ŀ	İ	
Cyclops	8.8	17	4.8	2.4		19	11.7	0		Ì	
Nauplii	61	40		7.2					1		
			1			1	1			1	
Melosira	51	102	21				1		1	1	
Fragillaria	256	68		46.9		1				1	
Asterionella	38	89	12.8	12.8			-				
Anabena	332	38	1								1
Clathrocyctis	3,306	1,079	294	273							
Oscillatoria	17				1				1	ļ	
Lyngbya							1				

TABLE 27. LAKE: HOG Date: 7/23/29

.

	Plan	kton					Di	ssolved	Gases			
Species	0-5	5-9	10-15	15-20	Π	D	Т	0		1	_	_
Ceratium	1,058	268	-						%	CO ₂	Сь	
Dinobryum	4,151	529	1			s	26.6	5.98	106	0	27.80	_
Aneura	8	-				2	26.6	5.76	102	0	28.24	
Polyarthra Asplanena		1				4	23.9	6.25	106	0	28.60	ĺ
Hexarthra	51	25		- 1		6	19.4	5.21		3.40	31.32	I
Daphnia	128	21		- 1		9	13.3	.34		6.62	38.54	1
	3.6	4.8		- 1			1	1		0.02	90.04	l
Diaptomus Cyclops Nauplii	6.4 12 24.8	4.8 4.8 28										
Melosira	17	12							- 1	1		
Fragillaria	2,124	419				1					- 1	
Asterionella	1 1	8	- 1:							İ	- 1	
Anabena		4										
	1,356	435	- 1									
Oscillatoria Lyngbya		268										

TABLE 28. LAKE: HOG BACK Date: 7/24/29

24

Plankton

Species	0-5	5-8	10-15	15-20	D	T	0	%	CO ₂	Cb
Ceratium	3,741	567			s	24.7	4.90		0	40.28
Dinobryum	89	21			2	23.6	5.01		0	40.74
Aneura	179	12.8			4	19.4	.54		5.90	42.44
Polyarthra Hexarthra Noltholca	46	51 4			6	14.4	0		12.02	44.94
Asplanena Daphnia	140 200 40	25 3			8	13.9	0		16.78	48.12
					!					
Diaptomus	4.8	.8								ļ.
Cyclops	56	1.6								
Nauplii	115	12.8								
Melosira	4,906	503		-						
Fragillaria Tabellaria	1,463	512								
Asterionella	13,644	2,990								
Anabena	34		1							
Clathrocyctis	1,288	277			ļ					
Oscillatoria Pediastrum Lyngbya	38 3,946	213 750								

TABLE 29.

LAKE: JAMES LAKE, Station N.
Date: 6/19/29

Plankton

Disseland O

							Di	solved	Gases		
Species	0-5	5-10	10-18	5 15-20		D	Т	0	1 %	CO:	Сь
Ceratium	2,448	332	284	11		s	24.4	6.1	104	-	-
Dinobryum	19,051	288	136	21		2	23.3	6.2	104		39.96
Aneura Triarthra	25	3	7	12		4	20.8	6.5	104		38.42
Polyarthra	ł	1	1	8		6	17.8	6.8	103		37.40
Noltholca Asplanena	1	1	2	١,		8	13.75		100	1.26	38.92
Daphnia	4.5	6	4	6		10	12.8	5.1	ĺ	1.50	38.92
Holopedium	113			1		12	11.4	5.4		1.50	37.92
Diaptomus	12	89	ł	4		15	10	5.2		1.50	38.92
Cyclops	13	64		5	- 1						30.02
Nauplii	19	64		4		20	7.3	4.8		1.50	38.42
Melosira	7,597		236	217	-						
Fragillaria	9,525	l i	1,752	1,203		25	6.7	2.3		3.52	38.92
Asterionella	567	1 1		196				ł		- 1	
Anabena			1	179			1			ļ	
	11,680	204	.	[1	l		
Oscillatoria	226		12	.				ŀ	l		ĺ
Lyngbya	- 1							Í	- 1	į	

TABLE 30.

LAKE: JAMES, Station B. Date: 6/21/29

Dlamleton

	Plank			Diss	olved C	ases				
Species	0-5	5-10	10-15	15-20	D	Т	0	%	CO ₂	Сь
Ceratium	1,105	298	76	93	S 2	24.2 23.9	6.0	103 104	50 74	37.40 36.90
Dinobryum	3,357	439	149	51	4	21.4	6.3	103	74	36.40
Aneura Hexarthra	42	4.2	17 4.2	49	6	16.9	6.4		50	37.66
Polyarthra Noltholca	8	12.8	4	4.2	. 8	14.4	6.1		0	37.40
Triarthra Asplanena		8.5	1.6	12 4.2	10	14.2	5.8		1.50	38.42
Daphnia	8	8.8	8.8	12.8	12	13.3	4.7		.50	37.66
					15	13.1	4.0		.62	37.92
Diaptomus	. 8.8	4.8	14.4	10.4						
Cyclops	21.6	3.2	7.2	5.6	20	11.7	2.0		1.38	39.18
Nauplii	42	29	4	29.6						
					٠ نـ			l		ļ
Melosira	422	51	119	294		Ì	İ			
Fragillaria	849	772	1,186	2,769		1				
Asterionella	273	435	362	593						1.
Anabena							l			
Clathrocyctis	1,809	430	221	264						1 1
Oscillatoria	38	55	221	12						
Lyngbya	558	98	72	25						
				1						

TABLE 31.

LAKE: JAMES, Station I.

Date: 6/26/29

Plankton Dissolved Co.

					,		D	issolved	Gases		
Species	0-5	5-1	10-	15-20		D	Т	0	%	CO ₂	Cb
Ceratium	2,321	422	179	51			02.0				
Dinobryum	977	166	17	21		8 2	23.3 23.3	6.3	106 108	1.21	35.76 35.76
Aneura	38	17	38	51	1	4	20.6	7.2	116	.72	35.76
Polyarthra Noltholca Triarthra	12	8	8			6 8	16.7 13.9	7.4 6.9	110	0	36.0 36.50
Hexarthra Daphnia	4 4 20	4	8 8 8 7.2	21	1	10	12.8	5.9		2.20	36.50
Dapinga	20	4	7.2	8		12	11.7	4.8		4.40	37.91
Diaptomus	15	11	10	4.8		15	10.3	5.4		3.42	36.74
Cyclops	82	6	9	4.8	- 1			- 1			
Nauplii	11	34	6	11.2	- 1	20	8.9	2.6		4.90	37.24
Corethra	1	.8	4	12	- 1	22	8.9	1.5	- 1	- 1	37.24
Melosira	64	68	102	435	- 1				- 1		
Fragillaria	2,180	1,326	1,258	2,112			1		1		
Asterionella	256	422	170	136	- 1	1	- 1			1	
Anabena	1				- 1				-	- 1	
Clathrocyctis	5,491	1,160	516	733							
Oscillatoria	81	64	8.5	46	- 1						
Lyngbya	226	631	388	51							

TABLE 32.

LAKE: JAMES, Station E. Date: 7/2/29

Plankton

Species	0-18	5-10	10-15	15-20		D	Т	0	%	CO ₂	Сь
Ceratium	1,194					s	22.2	7.1	116	-1.55	36.21
Dinobryum	8			i		2	22.2	7.0	116	-1.03	36.72
Aneura	52					4	22.2	7.2	116	1.03	36.46
Polyarthra	13					6	18.9	7.0	109	0	36.98
Noltholea	20					8	14.7	6.8		1.29	37.76
Daphnia	1.7					10	13.7	5.7		1.81	38.03
						12	13.3	4.3		3.10	38.53
n.					ı	15	13.1	3.7		2.30	38.02
Diaptomus	18.7					17	12.8	2.7		2.84	38.28
Cyclops	19.5									1	
Nauplii	19.3										
Melosira	210							ļ			
Fragillaria	4,222			1	-						
Asterionella	722		ļ		- 1						
Anabena	4		İ								2.1.
Clathrocyctis	56							1			
Oscillatoria											
Lyngbya	194										

TABLE 33.

LAKE: JAMES, Station U. Date: 7/2/29

			n					Di	ssolved	Gases		
	Species	0-18	5-10	10-15	15-20		D	Т	0	1 %	CO	Cb
	Ceratium	610	-			1	s	-				
	Dinobryum	74					2	22.1				
	Aneura	35					ł .	21.7				1
-	Polyarthra	11					. 4	21.1	7.01	114	-1.03	37.50
- 1	Noltholea	9		- 1	.		6	16.4	7.07	104	26	38.02
- 1	Daphnia	3.7	- [1			8	13.9	6.7		1.03	39.05
-		"			ĺ	- [10	12.8	6.2		1.55	39.57
		1 1	- 1	1		- 1	12	11.1	5.5		1.81	38.02
	Diaptomus	14		ĺ	. [- 1	15	10.2	4.3		3.10	38.28
	Cyclops	13	- 1	- 1	1	- }	18					50.20
	Nauplii	13	- 1		-		. 18	10	4.1		4.13	38.79
1	Melosira	158										
1,	Fragillaria	3,011		- 1	- 1		- 1				-	
1	Asterionella	389					- 1		1			1
1	inabena	369			ĺ						İ	- 1
0	Clathrocyctis	37		- 1			-			- 1	- 1	
1	scillatoria		İ				ĺ				- 1	. /
L	yngbya	483									-	- 1:

TABLE 34. LAKE: JAMES, Station M. Date: 7/4/29

Plankton

			_								
Species	0-5	5-10	10-15	15-20		D	т	0	%	COz	Сь
Ceratium	648					s	21.4				
Dinobryum	76					2	21.4				100
Aneura	39					4	21.4	6.2	101	75	37.16
Polyarthra	14					6	18.9	6.0	,	50	36.90
Noltholea	11					8	14.7	6.3		1.26	37.66
Daphnia	4					10	13.7	5.4		1.76	39.67
						12	11.7	4.7		1.76	37.66
Diaptomus	13.9					15	10	3.7		2.52	38.42
Cyclops	12.6										
Nauplii	27.0					19	9.7	3.2		3.53	39.17
Melosira	176										
Fragillaria	3,450			i							
Asterionella	436		ļ	i							
Anabena	1				ı						1
Clathrocyetis	90				İ						
Oscillatoria	34										
Lyngbya	614										59 11

TABLE 35.

LAKE: JAMES, Station N. Date: 8/6/29

Plankton

					7				Gases	_		
Species	0-5	5-10	10-1	15-20		D	т	0	%	CO ₂	Сь	
Ceratium	1,271	234	85	140] ,	s	22.8	5.90		0	-	-
Dinobryum	21	17	4	1		2	22.2	5.80		1 -	34.36	
Aneura	243	38	1	12		4	22.2	5.90		0	33.86	
Polyarthra	12					6	20.9			0	32.10	- 1
Noltholea		4	4] [8	1	5.74		0	32.16	- 1
Daphnia	4	6	2.4	2.4		_	15.5	5.79		.98	37.10	1
İ			7.7	2.4		10	13.3	3.59		3.22	38.34	1
				i i		12	11.7	2.71		4.22	37.58	ļ
1	1				ł	15	10.6	2.59		5.22	38.34	1
Diaptomus	3.2	4.8		8	- 1			- 1.5.		0.22	30.34	
Cyclops	18.4	12	2.4	5.6								l
Nauplii	53.6	15.2	4	5.6		20	8.3	2.77		5.46	38.34	
Melosira	42	42	25	38		az			ĺ			
Fragillaria	533	315	149	179		25 26	7.1	.06	- 1	7.96	40.08	ŀ
Asterionella					- [- 1		í				
Anabena	21	51	ĺ	12		1	- 1	-	1	1		
Clathrocyctis	256	793	170	64	- 1		1		- 1			i
Oscillatoria	183	332	76	128			j		- 1			
Lyngbya												

TABLE 36. LAKE: JAMES, Station L. Date: 8/7/29

Plankton

Species	0-5	5-12	10-15	15-20	D	Т	0	%	CO 2	Сь
Ceratium	115	136			s	22.2	5.82		0	35.10
Dinobryum	8.5	21			2	22.2	5.66		0	34.60
Aneura	42	.8			4	22.2	5.73		0	34.10
Polyarthra					6	21.7	5.36		0	34.10
		İ			8	15.3	4.0		2.72	37.34
Daphnia	14	9.6			10	13.7	2.54		4.72	39.08
					12	11.9	2.43		4.48	38.34
Diaptomus	5.6	9.6								
Cyclops	29.6	16								
Nauplii	64	12.8								
Melosira	25	17								
Fragillaria	149	213								
Asterionella		4								
Anabena	8									
Clathrocyctis	55	388								
Oscillatoria	149	46								
Lyngbya	4	59								

TABLE 37.

LAKE: JAMES, Station B. Date: 8/7/29

								Ţ	Dissolved	Gases	3		
	Species	0-5	5-10	0 10-1	5 15-2	0	D	Т	0	1 %	CO2	Cb	-
1	Ceratium	435	256	68	42		s	22.5	5.70		0	34.98	-
İ	Dinobryum	12					2	22.2	5.94		0	34.22	
	Aneura Hexarthra	85	25	8.5	8.5	ŀ	4	22.2	5.33		0	33.86	į
	Polyarthra Noltholca	4	12.8	1	1		6	21.4	5.51		0	34.48	i
1	Triarthra			4.2			8	16.1	4.43 2.35		3.98	38.08	-
1	Daphnia	4	3.2				12	13.3	1.34		4.72	39.08 38.08	
				1	1		15	13.3	. 58				
1	Diaptomus	7	8.8	10	.8			10.0	.00		6.22	38.34	l
1	Cyclops Nauplii	8	7.2	5.6	1.6		20	12.2	.09				ĺ
1	Corethra	34	29	4	.8		20	12.2	.09		6.22	39.58	
h	Melosira	68	25	17	12.8								
1	Fragillaria	209	285	72 .	119								
1	Asterionella Anabena										ĺ		
	Clathrocyctis	563	742	247	226								
1	ecillatoria	64	42	21	46					ĺ	ŀ	ĺ	
1.	yngbya	59	90	8	17	ļ					1		
_							1		J		- 1		

TABLE 38.

LAKE: JAMES, Station J.

Date: 8/8/29

Plankton Dissolved Gases

	Plankto	_									
Species	0-5	5-10	10-15	15-20		D	т	0	%	CO2	Сь
Ceratium	465	200	51	12		8 2	22.8 22.8	5.99	100 102	0	34.60 33.10
Dinobryum	12	1	4			4	22.5	5.68	1	0	33.36
Aneura	42	8	8	17		6	20	5.35		0	33.86
Polyarthra Noltholea	4.2		4	8		8	15.6	4.32		.24	33.84
Hexarthra	4.2	Ì	_			10	13.1	3.68		4.72	38.58
Daphnia	14.4	4	.8	14		12	11.9	2.97		4.48	37.84
						15	10.3	2.70	1	6.72	37.34
Diaptomus	13	9.6	4.8	8				1			
Cyclops	32	6.4	6.4	5.6		20	1	1		1	
Nauplii	16	4.8	2.4	2.4		21	8.9	.13	1	7.96	39.58
			1				1				
Melosira	68	8	46	64						1	1
Fragillaria	196	149	55	81			-				
Asterionella	8	4	1				1			-	
Anabena	29			1	}	1				1	
Clathrocyctis	435	1,181	i	554				1			ļ
Oscillatoria	776	25	25	17			Ì		1		1
Lyngbya Synedra	12	25	17 17	17					1_		

TABLE 39. LAKE: JAMES, Station I. Date: 8/9/29

	Plankt	on					_					
Species	0-23	5-10	10-15	1	_		D:	ssolved (Jases			
Ceratium	345		10-15	15-20		D	Т	0	1 %	CO2	СЬ	-
Dinobryum	345					s	23	6.12	102	0		_
Aneura	41		- 1	- 1	- 1	2	23	6.01	101	0	34.12 33.62	
Polyarthra Noltholea	4.7 7.1	- 1	- 1		- 1	4	22.6	1	104	0	33.38	- 1
Daphnia	1 '.1		- 1	- 1	- 1	6 8	20.9	10.10		0	33.62	-1
Dapnnia	5.9		- 1		-	10	15 13.3	4.05		4.0	27.30	1
1		- 1	- 1	- 1	-	12	11.9	3.80 2.58	- 1	5.14	29.02	l
Diaptomus	9,9		- 1-			15	Ι.	' 1]	5.88	37.56	l
Cyclops	16.9				1	10	10	2.12	- 1	5.88	38.54	
Nauplii	12.8				1		- 1		- 1	- 1	- 1	
Melosira	1 1				1	- 1	- 1	- 1	- 1			
Fragillaria	58 402		- 1	- 1		23	8.6	. 17	18	3.34 4	10.26	
Asterionella	102				1						.0.20	
Anabena	2		-	- 1				- 1		- 1		
Clathrocyctis	48											
Oscillatoria Lyngbya	42	-				- 1						
25 ligoya	61		-					- 1		- 1		
									-	-		

TABLE 40.. LAKE: JAMES, Station N.

Date: 8/14/30

Plankton	Dissolved Goo

Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO ₂	Сь
Ceratium Mallomonas	887	149	55 8.5	21		s	24.4	5.42		-1.2	33.2
Dinobryum	21	8	4	i	i	2	23.6	5.45	İ	-2.4	35.6
Aneura	149	29	4	17		4	23.3	5.39		-2.6	34.8
Polyarthra Noltholea	29	51 12		4		6	23.3	5.13		-2.0	35.6
Asplanena	4	1	ļ	1		8	15	3.67		0	40.0
Daphnia		6.4	.8	4		10	11.5	3.25		1.0	41.4
						12	9.1	2.97		1.0	40.8
Diaptomus	14	20	.8	1.6		15	8.1	2.71		1.0	41.4
Cyclops	47	12	2.4	3.2		1	1				
Nauplii	857	7	.8	9.6		20	6.6	2.44		1.4	41.4
Melosira	81	51	12	46							
Fragillaria	529	247	38			25	6.1	.08		1.4	42.8
Asterionella											
Anabena	12	8	4	- 1							
Clathrocyctis	588	337	64	59							
Oscillatoria	81	136	25	59				İ		ĺ	
Lyngbya											

TABLE 41. LAKE: JAMES (3rd Basin) Date: 8/22/30

1	FIA	nkton						D	issolved	l Gases		
Species	0-4	5 5-1	0 10-1	5 15-2	0	D	т	10	%	CO2	Ch	7
Ceratium Mallomonas	1,03	2 204	145 17	145		s	22.2	5.71			-	pH
Dinobryum Uroglea Aneura	34 89 68	12 29 46	21	8	1	2	22.2	1		-2.0		8.3
Difflugia Polyarthra Noltholca	138 21	46	29 17	46 25		4 6	22.2	0.02		-1.4	34.0	8.3
1	12		21	34	$ \cdot $	8	22.2 15.2	5.83 5.61		-2.0	33.8	8.3
Daphnia Diaphanosoma	4.8	1.6	2.4	10.4 3.2		10	11.6	2.90		.4	35.8 40.4	7.8
						12	9.4	2.72		1.0	41.0	7.6
Diaptomus	27	7.2	8.8	14		15	7.9	2.11		1.6	40.4	7.5
Cyclops Nauplii	25	26.4		18.4			į					
- wapin	56	11.2	23.2	26.4		20	7.2	2.45		2.0	40	7.5
Melosira	174	76	136	140			- 1			1		
Fragillaria Asterionella	840	282	187	174		25	6.2	.06	İ	2.4	41.4	7.2
Anabena	46	8.5	4									
Clathrocyctis	465		1	264						1		
Oscillatoria	106	17	25 1	28						1		
Lyngbya	132		46	81							-	. -

TABLE 42.

LAKE: JAMES (3rd Basin)

Date: 8/30/30

Plankton

0-5	5-10	10-15	15-20		D	Т	0	%	CO ₂	Сь	pН
					s	23.3	5.71		2.2	33.8	8.3
					2	23	6.42	107	2.4	33.6	
					4	22.4	6.07	101	-2.6	34.4	i
					6	21.6	5.73		-2.0	34.4	
					8	16.1	3.39		1.2	37.8	
					10	11.7	2.56		2.8	40.4	ĺ
					12	9.7	2.07		2.8	44	
				Ì	1,2	7.0	9 10		0.8	10.4	
				İ	13	1.0	2.10		2.0	10.1	
								}			
					20	6.9	2.42		2.0	40.4	
					25.5	6.2	.10		2.8	43.0	7.5
			ł	İ			i				
	ĺ										
				i	ĺ						
						ĺ		i			
	0-5					S 2 4 6 8 10 12 15 15 20 25.5	S 23.3 2 23 4 22.4 6 21.6 8 16.1 10 11.7 12 9.7 15 7.8 20 6.9 25.5 6.2	S 23.3 5.71 2 23 6.42 4 22.4 6.07 6 21.6 5.73 8 16.1 3.39 10 11.7 2.56 12 9.7 2.07 15 7.8 2.18 20 6.9 2.42 25.5 6.2 .10	S 23.3 5.71 2 23 6.42 107 4 22.4 6.07 101 6 21.6 5.73 8 16.1 3.39 10 11.7 2.56 12 9.7 2.07 15 7.8 2.18 20 6.9 2.42 25.5 6.2 .10	S 23.3 5.71 ——2.2 2 23 6.42 107 —2.4 4 4 22.4 6.07 101 —2.6 6 6 21.6 5.73 —2.0 3 8 16.1 3.39 1.2 10 11.7 2.56 2.8 12 9.7 2.07 2.8 15 7.8 2.18 2.8 20 6.9 2.42 2.0 2.0 25.5 6.2 .10 2.8	S 23.3 5.71 —2.2 33.8 2 34.4 107 -2.4 33.6 4 22.4 6.07 101 —2.6 34.4 6 21.6 5.73 —2.0 34.4 8 16.1 3.39 1.2 37.8 10 11.7 2.56 2.8 40.4 12 9.7 2.07 2.8 44 15 7.8 2.18 2.8 40.4 20 6.9 2.42 2.0 40.4 25.5 6.2 .10 2.8 43.6

TABLE 43. LAKE: JAMES (3rd Basin)

Date: 9/7/30

		nkton						I	Dissolved	Gases		
Species	0	5 5-	10	10-15	15-25		D	Т	0	_	T.	
Uroglea Ceratium	691 1,484	81 328							-	%	COz	Cb
Dinobryum Mallomonas	55	29	- 1	106 4	145		s	22.2	5.88		-1.6	33.
Aneura	110 85	34		17.1 4.2	21 59		2	22.2	0.11	101	-1.6	34.
Polyarthra Triarthra	12.	38	-	17.1	12		4 6	22.2	0.00	100	-2.4	32.
Noltholea	- 1	8		8.5	8		8	21.6	5.82		-2.4	32.
Daphnia Bosmina Diaphanosma	4 2.		1	7.2	6.2		10	11.6	3.70		0	35.
- wpaunosma		-1	8	12.8	.8	- 1	12	10	1.95		1.4	37.
Diaptomus	4.8	3 8			- 1		15	8.0	1.76			39.6
Cyclops	16.8	9.6		8	5.6			0.0	1.76	- 1	1.4	41.(
Nauplii	21.6	10.8	1	2.8	9.6		20	6.9	1.72		2.0	10.0
Melosira	85	72	81	.	85		- 1		- 1		2.0	42.0
Fragillaria	1,766	814	405	· / `			25	6.6	.07	- 1	2.4	
sterionella nabena	354	25	46		-		.				2.4	42.0
Nathrocyctis	98	477	106	- 1	a					- 1		
scillatoria	106	72	72	41	`			- 1				
yngbya		166								- 1	- 1	

TABLE 44. LAKE: JAMES (3rd Basin) N.

Date: 9/20/30

Plankton Dissolved Gases

Species	0-5	5-10	10-15	15-20	D	Т	0	%	CO ₂	Сь
Difflugia Ceratium Uroglea Dinobryum Mallomonas Aneura	59 704 302 132 21 81	17 311 38 46 33 61	17 81 12 17 25 34	76 8 30 8 38	S 2 4	21.1	5.11		-1.25	33.4
Polyarthra Noltholca Asplanena	34 4.2 4.2		12	8	6 8 9	20.5 16.3 13.8	5.56 4.21		0 1.0	33.4 34.8 50.4
Daphnia Bosmina	.8	.8	2.4	2.4	10 12	9.4	1.19		7.10 1.50	40.0
Diaphanosoma	.8	1.6	4	4	15	8	1.61		3.02	40.4
Diaptomus Cyclops Nauplii	7.2 14.4	14.4 13.6	9.6 14.4	3.2	20	7.0	1.55		3.02	40.4
Melosira	64	38	38.4	30.8	24.5	6.6	.12		4.06	41.8
Fragillaria Asterionella	1,339	1,651	494	264						
Anabena	21		8.5						[
Clathrocyctis	252	512	166	187						
Oscillatoria	140	93	17	30					1	
Lyngbya	115	106	57		_					

TABLE 45. LAKE: JIMMERSON Date: 7/19/29

							.,	19/29						
			Plank	on										
	Species	T	0-5	5-10	10-17	T	T	,	Di	ssolved (lases			
	Ceratium				10-17	15-20		D	Т	0	%	CO		_
II C N C M Fr	Ceratium Dinobryum Aneura Aneura Aneura Anoloica Asplandna Hexandna Daphnia Bosmina Diaptomus Cyclops fauplii oroethra elosira agillaria terionella		1.6 3 .8 13	57 242	76 4 8 4 8 2.4	13-20		S 2 4 6 8 10 12 17	24.4 24.4 24.2 17.2 13.9	0 5.57 5.57 4.53 4.99 3.26 1.77 .47	6	2.70 2.70 1.94 3	Cb 33.10 32.62 32.38 34.10 37.56 39.54 8.54	
Cla Osc	abena throcyctis illatoria gbya	8 682 72 115	576 21 413	614 17 136										
												Ŀ		

TABLE 46.

LAKE: LONG (Steuben)
Date: 7/25/29

Dissolved Gases

Species	0-5	5-9	10-15	15-20		D	т	0	%	CO ₂	Cb
Ceratium	1,493	362				s	24.4	5.33		4.18	47.72
Dinobryum	435	119				2	21.9	5.24		5.40	48.94
Aneura	119	29				4	17.2	1.16		7.04	49.44
Polyarthra				1		6	14.4	.11		11.56	47.46
Noltholea Hexarthra	29 4	12 4				8					
Daphnia	48	1.6				9.5	12.2	0		15.74	57.06
Diaptomus	14	1.6									
Cyclops	24	2.4									i
Nauplii	68	10			ļ	,					
Melosira	10,146	2,986									
Fragillaria	3,072	3.566			1						
Asterionella	1,962	4,232						ľ	l		
Anabena	1,002	1									
Clathrocyctis	170	64									
Oscillatoria										1	
Lyngbya	998	298			1						

TABLE 47.

LAKE: LOON Date: 7/26/29

		Plank	ton					Di	ssolved	Carri			
	Species	0-4	5-10	10-15	15-20		D	T	0	_			
ı	Ceratium	823								1 %	C)2	Сь
- /	Dinobryum	17					s	26.7	4.76	1	1.9	8 2	4.10
	Aneura	174	1 1	- 1			2	25.6	4.42		1.1	6 2	3.86
	Polyarthra Triarthra	17					4	21.4	1.99		3.9	2 25	.82
	Hexarthra	12	1 1			- 1				l	1		
	Daphnia	30		- 1		- 1						1	
F A A	Diaptomus Cyclops Nauplii Melosira Yagillaria sterionella nabena lathrocyctis	11 3.2 47 4 8 221							-				
	Ingbya												

TABLE 48.

LAKE: LONG LAKE (N. Basin)
Date: 8/20/30

Plankton

						Dis	solved (<i>i</i> ases		
Species	0-5	5-10	10-18	15-20	D	т	0	%	CO ₂	Сь
Ceratium	51	34	8		s	23.8	4.43		-1.0	23,2
Dinobryum	209	4,364	665		2	23.8	4.51		-2.4	23.2
Aneura	8	4			4	23.5	4.43		-2.4	23,2
Polyarthra Hexarthra Noltholea	8 8	4.2			6	21.3	4.85		-1.4	23.2
			4		8	13.3	1.95		.4	30.4
Daphnia	6.4	19	2.4		10	10.5	.35		1.2	29.8
					12	10	. 17		1.0	30.8
Diaptomus	37	12			15	9.4	.05		.6	30.8
Cyclops	15	52	6.4	İ	18	8.8	.05		1.4	32.2
Nauplii	55	115	2.4						***	02.2
Melosira	4	64	17							
Fragillaria	4	4		ĺ	1 1	l	- 1	1	[
Asterionella						l	ŀ		1	
Anabena	170	81	8				1			ĺ
Clathrocyctis	4,535	2,905	401			- 1	1		- 1	ĺ
Oscillatoria	89	76	25		1 1	ŀ		- 1	- 1	
Lyngbya	341	746	17			ľ				i

TABLE 49.

LAKE: LONG LAKE (S. Basin) (LaGrange)
Date: 8/20/30

	Pis	nkton						Di	ssolved	Gases		
Species	0-	5 5-:	10 10-	15 15-	21	D	Т	0	%	CO2	СЬ	
Ceratium	140	42	8.	5 2		8	23.8	5.03				pH
Dinobryum	311	759	657	106		2	1	1		-1.6	23.8	8.3
Aneura		8.	5	1		4		1 01.10		1.6	22.6	8.3
Polyarthra Asplanena				1		1	1 -0.0	0.10		-1.2	23.2	8.3
Noltholea	4		-	4		6	72.0	4.51		-1.0	23.6	8.3
Daphnia	8	1 .	8 12		.	8	12.7	1.53		1.0	29.6	7.5
Leptodera		- 1	12	1.0	, [10	10.5	.31		1.0	29.8	7.1
1	- "					12	10	.34	- 1	2.0	29.8	7.1
Diaptomus	16	4	1.6	.8		15	9.0	.08		2.0	30.2	7.1
Cyclops	24	18	12	1.6	1	1			1	1		
Nauplii	98	55	23	1.6					- 1			
Melosira				1	1 1	22	8.8	.005	1	2.2	31.2	7.1
1	8	21	17	1	Ш	-					01.2	. 7.1
Fragillaria	38	12	85	4	П	1				- 1		i
Asterionella	1	1			П	1	- 1			1	ı	i
Anabena	234	55	12		1 1			- 1		}		
Clathrocyctis	3,549	1,267	652	251			-	- 1			1.	
Oscillatoria	123	38	34	25			- 1	- 1	- 1		- 1.	
Lyngbya	311	499	136	25								.

TABLE 50.

LAKE: OLIVER (LaGrange)

Date: 9/6/30

Plankton

Species	0-5	5-10	10-15	15-25	D	т	0	%	CO ₂	Cb	рH
Ceratium	1,083	1,024	251	51	s	25	5.53		6	32.8	8.2
Dinobryum	21				2	22.2	6.10	101	-3.0	33.6	8.2
Aneura Hexarthra	76 8.5	34		21	4	22.2	6.07	100	-3.2	33.8	8.2
Polyarthra Noltholca	51 4.2	4.2	2.4	12 12	6	21.2	5.09		2.0	33.8	. 8.2
Asplanena	4.2	4.2	2.4	12	8	15.5	5.33	-	0	37.4	7.9
Daphnia	3.2	3.2	.8	8.8	10	10.5	4.51		.6	40.4	7.6
Bosmina Holopedium	4 3.2				12	8.8	3.84		1.2	39.4	7.6
Diaptomus	9.6	5.6	8.8	4.8	15	8.3	2.81		1.0	40.4	7.5
Cyclops	5.6	17	23	24							
Nauplii	24	16	28	76	20	7.7	1.03		1.0	41.8	7.5
Melosira	17	162	311	678	25	7.7	.21		2.2	41.8	7.5
Fragillaria	234	128	106	64	20	1.1	.21		2.2	41.0	7.3
Asterionella	4	21 .									.
Anabena	4	34	128								
Clathrocyctis	260	371	166	140							
Oscillatoria	85	38	64	25							
Lyngbya											

TABLE 51. LAKE: LOWER OTTER

Date: 7/18/29

Plankton

6 .						,	151	ssorved	Gases		
Species	0-5	5-12	10-15	15-2)		D	Т	0	%	CO2	Cb
Ceratium	68	16		ĺ		s	24.8	6.15	106		
Dinobryum	162					2	24.8	1		.0	42.00
Aneura	12.8	:				4	Į.	6.10	106	.0	42.00
Polyarthra		ł	į	ļ			21.7	5.78		.0	41.52
Noltholca	.8	1				6	14.7	4.11		2.20	40.02
Daphnia	8	3.2	ĺ		- 1	8	10.9	3.36		3.56	39.54
	1 °	3.2		i		10	10.6	. 57		7.52	39.54
		1			- 1	12	10	.11		6.92	40.02
Diaptomus	4.8	1 1	-		-					- 1	
Cyclops	19.2	9.6		- 1	- 1	1				1	
Nauplii	19.2	17.6									
Melosira		76									
Fragillaria	2,606	3,140		-		1					
Asterionella		40				1				- 1	
Anabena		20				- 1	- 1				
Clathrocyctis	904	1,975			İ	- 1				İ	ł
Oscillatoria		294					İ				
yngbya	"	201							-	İ	

TABLE 52. LAKE: PLEASANT

Date: 7/9/29

Plankton

Species	0-5	5-10	10-13	15-20		D	Т	0	%	CO2	Сь
					ĺ	s	23.9	5.7		0	24.46
Ceratium	9,464	38,451	18,278		İ	2	23.6	5.6		0	24.22
Dinobryum	396	64	196		Ì	4	23.3	5.6	ł	0	23.72
Aneura	12.8	25			ļ	6	20	6.1	ļ	0	24.42
Polyarthra Hexarthra	4	8	4			8	15.6	6.3		1.46	28.36
						10	12.8	2.9		4.64	28.12
Daphnia	8	4.8	2.4			12 13	11.7	67		5.12	29.84
						15					
Diaptomus	12	4									
Cyclops	1.6	.8									
Nauplii	4	25	8.5			20					
Corethra	1	4	.8								
Melosira	200	294	110			25					
Fragillaria Tabellaria Asterionella	51 1,506	332 4	$^{17}_{631}_{4}$			30					
Anabena	524	38	4			30					
Clathrocyctis	277	128	251								
Oscillatoria	38	8	8					1		1	
Lyngbya	42	64				İ					
	1	1	1		1	·					

TABLE 53. LAKE: PLEASANT LAKE Date: 7/23/29

Plankton

							Di	ssolved	Gases		
Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO2	Сь
Ceratium	136	21.				s	25.6	5.57	<u> </u>	0	24.96
Dinobryum Aneura	-					2	25	5.42		0	25.06
Polyarthra	- 1					4	23	5.74		0	24.38
Noltholes	1				!	6	22	4.60	[1.80	24.50
Hexarthra Daphnia	1.6 12.8 25	4 4 2.4			- 1	8	17.2	.37		4.98	27.24
	25	2.4				10	14.4	.09		4.54	28.60
Diaptomus	32										
Cyclops	1	.8		1							
Nauplii	4	2:4	1			i		[- 1		
	38	29					- 1	1		1	
Melosira	1	12							1	-	
Fragillaria	81	25									
Asterionella		12				- 1		- 1	[
Anabena Clathrocyctis	1,472	247									
Oscillatoria	17	12					- 1.	1	- 1		
Lyngbya	17	42							- 1	į	

TABLE 54.

LAKE: PRETTY Date: 8/18/30

Plankton

Species	0-5	5-10	10-15	15-20	D	т	0	%	CO2	
Ceratium	2,948	102	72	128	s	23.8	5.18		-2.4	
Dinobryum	1,966 106	42 68	25	34 25	2	23.8	5.24		-1.4	:
Aneura Hexarthra	264 17	12 12.8	4 4.2	5.6	4	23.3	5.16		-1.6	
Polyarthra Noltholca	8.5	1.6	8.5	8	6	21.8	4.64		8	
Asplanena	21	8.5	8.5	l °	8 .	14.7	1.62		.4	
Daphnia	12 -	3.2	1.6	ļ	10	10	.85		1.0	
					12	9.4	.45		1.0	
					15	8.8	.35		1.0	
Diaptomus	44	4	2.4	.8	10	0.0	.00		1.0	
Cyclops	18	12	3.2	1.6						l
Nauplii .	332	50	10.4	4	20	8.3	.03		1.0	
Melosira	. 12	29	21	17	24.5	8.3	.04		1.0	١.
Fragillaria	4,083	334	162	98						
Asterionella	4	4		4.2					1	
Anabena	42			4						
Clathrocyctis	563	742	115	102			1			
Oscillatoria	132	29	12	4						
Lyngbya	25	1,036	55	81						1

TABLE 55.

LAKE: ROUND Date: 8/12/30

	PI	ankton					- D	issolved	Gases		
Species	0-5	5-1	0 10-15	15-20		D	Т	0	%	CO ₂	Ch
Ceratium	243	46	4.2			s	25	-		-	
Dinobryum	25.	6				2	1	5.05	0	-1.0	22.4
Aneura	17	4.	2			4	24.4			-1.0	21.
Polyarthra	-	- }			1		23.6	5.03		-1.4	21.
Asplanena Hexarthra	21 42	12.1	3		- 1	6	20.5	4.90		4	21.5
Daphnia	7.:	- 1	1 1		- 1	8	13.8	.24		3.0	28.8
Bosmina		.8	1		- 1	10	10.5	.335	-	3.0	28.8
		"			İ					İ	
Diaptomus	14.4	.	.8	1						- 1	
Cyclops	20.8	3.2	1 1	- 1		18			j	- 1	
Nauplii	68.2	25.6	"			18	9.4	.0		3.0	31.2
			1 1				ı			- 1	
Melosira	38.4	38.4	64	- 1		- 1					
Fragillaria	2,517	409	132			- 1			i		
Asterionella		4.2	1 1			- 1	į	1			
Anabena	755	55	17			- 1			ł		
Clathrocyctis	729	554	204							1	
Oscillatoria	98	25	85			1				- 1	
yngbya	17,937	742	593		- 1	- 1		1	-		

TABLE 56.

LAKE: SHRINER Date: 8/15/30

Plankton

Species	0-5	5-10	10-15	15-20	D	Т	0	°c	CO ₂	Ct
Ceratium	4	12	1		s	26.6	5.25		-1.4	23 .
Dinobryum	17	25	4		2	25.3	5.32		-1.0	24.
Aneura		2,201	42		4	25	5.33	İ	-1.4	24
Noltholea Polyarthra	-	38	.8		6	19.6	5.29		-1.2	23
Triarthra Hexarthra	17		2.4		8	12.7	6.63		0	26.
Asplanena Daphnia	14	4 24	4.8		10	10.5	2.39		1.0	26.
					12	7.77	1.23		2	26.
Diaptomus	6.4	52	8		15	8.8	.14		2	27.
Cyclops	1.6	19	2.4		18	8.6	.06		3.0	28.
Nauplii	34	25	10							
Corethra		4								
Melosira		25	25							
Fragillaria	418	209	46							
Asterionella									l	
Anabena	132	277	34							
Clathrocyctis	341	725	358							
Oscillatoria	8		405							
Lyngbya		2,926	59							

TABLE 57.

LAKE: SILVER Date: 7/24/29

Plankton

					,	,			Cases		
Species	0-5	5-11	10-15	15-20		D	Т	0	%	CO ₂	Сь
Ceratium	315	55				S	25	5.15		0	
Dinobryum	264	64				2	24.7	5.06		0	26.22
Aneura	21	1				4	23.1				26.54
Polyarthra					- 1		1	4.94		0	26.78
Noltholea Hexarthra	25 8	1 1			- 1	6	17.7	.22		4.88	31.32
Asplanena Daphnia	12	4				8	13.9	.10		6.34	31.32
	12	*				10 11	11.7	.0		8.16	36.08
Diaptomus	9.6	1.6									
Cyclops	4	.8	- 1	İ				1		1	
Nauplii	47	4.2							İ		
Melosira	140	217							Ì		
Fragillaria	102	17				j				1	
Asterionella .	704	119	l	1	.		- [1	1	1	
Anabena	8	1		İ	-	ĺ			- 1		
Clathrocyctis	1	341			-				.		
Oscillatoria -	140	34					- 1				
yngbya	17	320							ł		

TABLE 58.

LAKE: SNOW, Station O.
Date: 6/22/29

Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO2	Cb
Ceratium	640	55	42	38		s	24.7	5.6		.74	36.92
Dinobryum	38	8.5	4	4.2		2	24.2	5.6	i	.74	36.40
Aneura Hexarthra	72 21	4.2	12	17	İ	4	19.4	6.4	100.7	.60	38.42
Polyarthra Noltholea	12	17	17	4.2		6	15.6	5.5		.50	38.42
Asplanena	12	4.2	4	12.8		8	13.7	4.9		.74	38.42
Daphnia	10	4	2.4	1.6		10	12.2	4.1		1.50	38.92
						12	11.1	3.7		2.26	38.66
			ĺ	1		15	10.6	3.1		2.62	38.92
Diaptomus	13	22	5.6	1.6					ļ		
Cyclops	37	3.2	1.6	.8					[
Nauplii	44	25	25	10	١.	20	8.3	.15		3.02	37.92
Melosira	529	469	725	1,821		25	7.2	0	1	6.66	40.44
Fragillaria Tabellaria	733	297	460 110	384		25	1.2	U		0.00	40.44
Asterionella	85	98	34	140						ĺ	ĺ
Anabena	17	8									
Clathrocyctis	2,444	439	640	145							
Oscillatoria	157	17		12							
Lyngbya	315	34	59	46							

TABLE 59. LAKE: SNOW, Station Q. Date: 7/3/29

Plankton

							Di	ssolved	Gases			
Species	0-18	5-10	10-15	15-20		D	Т	0	96	CO:	Cb	-
Ceratium	382					s		ļ				-
Dinobryum	. 192					l. "	22.2	6.04	i	75	35.64	
Aneura	31					2	22.2	6.07		50	36.80	
Polyarthra	15			- 1		4	20.9	6.0		50	37.41	1
Noltholea	5		1	1		6	15.6	5.4		1.01	37.92	l
Daphnia	3.9		- 1	i	j	8	13.7	4.3		3.03	38.67	l
1	1 1		- 1			10	12.2	3.5		3.28	39.43	ĺ
	1 1					12	11.1	3.3		3.53	38.67	ĺ
Diaptomus	13.9				- 1	15	10.6	2.9	į	4.04	-39,43	
Cyclops	9.7	1	-	- 1		18		1	- 1	1.01	00.40	
Nauplii	30.8					18	10.4	1.8		5.50	39.43	
1			ł		- [-	1				
Melosira	168			- 1		- 1	- 1			1		
Fragillaria	925			- 1	-	- 1	- 1		1		1	
Asterionella	53				-	- 1	ł		ł			
Anabena	7.8					1	- 1			1.	- 1	
Clathrocyctis	132		- 1			-				- [
Oscillatoria	66							- 1		1	- 1	
Lyngbya Tabellaria	218 5.6											

TABLE 60.

LAKE: SNOW, Station S.

Date: 7/3/29

Plankton

Species	0-10	5-10	10-15	15-20		D	Т	0	%	CO2	Cb
Ceratium	324					s	21.7	6.1		5	36.15
Dinobryum	25					2	21.7	6.1		—.75	36.4
Aneura	25					4	20.9	6.1		25	36.15
Polyarthra	61					6	16.1	4.8		.75	38.42
Noltholea	8.5			İ		8	14.2	2.5		3.28	38.93
Daphnia	5.6					10	12.8	1.03		5.30	39.94
									i	i	
Diaptomus	13.2										
Cyclops	8										
Nauplii	31.6				ļ						ļ
Naupin	01.0		i						ļ		
Melosira	115	i								ļ	İ
Fragillaria	961		ļ								l
Asterionella	121		ĺ					ĺ	l	l	
Anabena	8.5		İ								
Clathrocyctis	140		1		į	ļ		ì	l		
()scillatoria	113			-	İ						
Lyngbya	63					ĺ		1	1	1	

TABLE 61. LAKE: SNOW, Station P. Date: 7/4/29

		T					Di	ssolved	Gases		
Species	0-15	5-10	10-15	15-20		D	T	0	76	CO2	Сь
Ceratium	238										
Dinobryum	133					s	21.4	6.0		-1.01	35.89
Aneura	186	1				2	21.1	6.0		50	36.15
Polyarthra	14		1		İ	4	20	5.8		5	36.90
Triarthra Noltholca	7.9 1.3		1			6	15.8	4.8		1.51	36.65
Daphnia	2,2	- 1				8	14.2	2.9		2.78	37.92
		- 1	1	-		10	12.8	2.1	1	1	37.66
			- 1			12	11.4	.89	- 1	- 1	37.66
Diaptomus	17.5			- 1		15	10,6	. 09		7.50	
Cyclops	8.7			- 1		1		1	- 1	7.58	38.42
Naupli.	26.2								- 1	- 1	
Melosira	56	- 1	- 1		- 1	- 1		- 1		İ	
Fragillaria	754					- 1					
Asterionella	59					1					
Anabena	1 1	- 1							ı		l
Clathrocyctis	159				-				-		1
Oscillatoria	50								ĺ		
yngbya	186						i				i

TABLE 62.

LAKE: SNOW, Station O.

Date: 8/6/29

	FIRMKO										
Species	0-5	5-10	10-15	15-20		D	т	0	%	CO2	Сь
Ceratium	840	106	51	34	İ	8	22	5.50			36.34
Dinobryum	516	12	8	12	-	2	22	5.49			35.34
Aneura	76	17	38		İ	4	22	5.43			35.34
Asplanena Polyarthra		١.	4			6	18.2	3.69		3.48	36.34
Noltholea Hexarthra	4.2	4				8	13.7	2.69		3.98	38.34
Daphnia				1.6		10	12	2.12		6.96	37.58
·						12	11	1.99		5.22	38.84
						15	10.6	1.68		5.46	39.34
Diaptomus	5.6	4	3.2	3.2		20	10.0				
Cyclops	12.8	9.6	1.6	1.6					i	ŀ	
Nauplii	16	8	1.6	5.6		20	8.6	.97		6.22	38.84
Corethra	42		1.6								
Melosira	183	213	72	38		25	7.5	.06		7.70	42.42
Fragillaria	435	226	157	320	İ	20	1	'**	-		
Asterionella	4	8	8						-		
Anabena	25						1		ļ		
Clathrocyctis	686	297	401	234							
Oscillatoria	115	29	42	38							
Lyngbya	64	149	12	8	•		İ				

TABLE 63.

LAKE: SNOW LAKE
Date: 8/14/30

							Б	issolved	Gases		
Species	0-5	5-1	0 10-1	5 15-20		D	Т	0	5%	CO ₂	Cb
Ceratium	832	80	25	110		s	23.8				
Dinobryum	119		4	21	١.,		1 -	0.01		2.2	36.€
Aneura	68		8.5	1 -		2	23.3			-2.2	36.6
Polyarthra			0.0		П	4	23.3	5.56		-1.4	35.8
	ĺ	1			1 1	6	20	3.87		-1.0	35.8
Daphnia	4.8	3,2	. [1		8	12.2	2.34		1.0	42.0
	1.0	3.2		17	ĺ	10	9.4	2.55		1.0	42.4
					- 1	12	8.8	1.50	- 1	1.0	42.4
Diaptomus	8.8	88	3.2	6.4		15	8.3	1.31		1.0	
Cyclops	28	18.4	6.4	20						1.0	42.4
Nauplii	`16	6.4	4	8.8	- 1	1				- 1	
			1	8.8	- 1	20	6.8	1.16		1.0	42.4
Melosira	46	64	146	123	- 1						
Fragillaria	115	1	29	46		24	6.3	.05		4.0	55.4
Asterionella	1			10		i	- 1	1			
Anabena				1							
Clathrocyctis	5,824	1,191	824				- 1			į	
Oscillatoria		128	- 1	.467							
yngbya		120	16	76		- 1					

TABLE 64.

LAKE: SNOW LAKE Date: 8/22/30

Plankton

Species	0-5	5-10	10-15	15-20	.	D	Т	0	%	CO2	Cb
Ceratium	1,877	337	127	38		8	22.2	5.03		.60	13.80
Acinetaetis Dinobryum	1,838	213 349	81 89	17		2	22.2	5.69		2.4	34.8
Aneura	128	38	17	12		4	22	5.99		→2.0	35.2
Triarthra Polyarthra	179	25 68	34			6	21.2	5.92		-1.4	35.4
Asplanena Noltholea	12			2		8	12.7	3.00		2.0	41.6
Daphnia		2.4	3.2	8		10	9.8	2.51		1.4	42.0
						12	8.9	1.47		2.0	42.2
						15	8.3	1.23		1.4	42.0
Diaptomus		9.6	4.8	8.8			•,-	1			
Cyclops	23	32	5.6	4							
Nauplii	36	14.4	4.8	17		20	7.2	1.11		2.4	41.4
Corethra		İ		.8	ļ			-			
Melosira	115	64	162	115		24.5	6.6	.09		3.0	44.0
Fragillaria	366	123	123	25			ĺ				
Asterionella											
Anabena	46	89		12							,
Clathrocyctis	17,412	3,468	806	302							
Oscillatoria	456	221	93	162							
Lyngbya		75	119	1							

TABLE 65. LAKE: SNOW LAKE Date: 8/30/30

Plankton

į

1		ankton							D	issolvec	l Gases		
Species	0	-5 5-	10 1	0-15	15-2	4	D	Т	1 0	1 %			T
Ceratium	341	345	6	4	21	-	s	-			CO	Сь	pH
Dinobryum	180	196	13:	2	21		2			100	-1.4	100.0	8.3
Aneura	42	25	4	1			4	1	1	108	-2.2	1 00.2	
Polyarthra	52	46	8	3.5		1	6	20.6	0.01		-2.4	34.4	1
-	- 1			- 1			8	12.2	2.50		0	45.8	
Daphnia		2.	4 6	.			10	9.5	1.60		1.4	44.0	1
·						П	12	8.8	1.10		2.0	41.6	
			1.								1.4	42.6	
Diaptomus	10	6.4	8		1.6		15	8.3	.95	- 1	1.4	43.8	
Cyclops	36	16	4									10.0	
Nauplii	24	49	4.	8			20	7.2	.92		3.4		
Melosira			1			- [1				3.4	43.0	
Fragillaria	25 217	30	68	- 1	4		24.5	6.6	.05		3.4	45.4	7.5
Asterionella	217	320	64	1	7		Ì			1		10.4	1.5
Anabena	8	12						- 1					- 1
Clathrocyctis	5,004		935	614									
Oscillatoria			196	59									İ
yngbya	1	1,207	72	1 30						- 1			-

TABLE 66.

LAKE: SNOW LAKE
Date: 9/2/30

Species		Plankto	11									
Continue	Species	0-5	5-10	10-15	15-24		D	Т	0	%	CO ₂	СР
Diaptomus	Ceratium	1.400	169		55			20.2	5.40		0	35.8
Polyarthra 102 8	Dinobryum Mallomonas	1,156 836	204 162	38								
Daphnia	Triarthra						6 7 8 9	18.3 16.3 11.1	2.70		-1.50 3.02	36.8 41.4
Bosmina		.8			5.6		10	10			1	- 1
Diaptomus	Bosmina	.8			Ì		12	9.4	.42		3.02	41.8
Displanting 1					į		15		.11		4.02	42.4
Nauplii	Diaptomus	.8	12	3.2			1			ļ	1	
Nauplii	Cyclops	12.8	55	12.8			i				1 59	19.4
Melosira 128 115 81 89 24.5 6.7 Fragillaria 7,436 1,416 430 17 Asterionella Anabena 238 149 4 Clathrocyctis 1,587 473 1,320 115 Oscillatoria 793 349 45 16	Nauplii	16.8	27	8	1	1	20		.06		3.02	12.1
Melosira 128 115 81 55 55 55 55 55	Corethra	ļ			1.6							
Fragiliaria	Melosira	128	115	81	1		24.5	6.7	1		i	j
Anabena 238 149 4 Clathrocyctis 1,587 473 1,320 115 Oscillatoria 793 349 45 16	Fragillaria	7,436	1,416	430	17				1			
Anabena 2.06	Asterionella			į	Ì	i					ĺ	1 1
Oscillatoria 793 349 45 16	Anabena	238	149		4							ì
Oscillatoria 150 Oat 10 76	Clathrocyctis	1,587	473	1,320	115							
Lyngbya 499 281 13 76	Oscillatoria	793	349	45	16							
	Lyngbya	499	281	13	76					_\		<u> </u>

TABLE 67.

LAKE: SNOW LAKE
Date: 9/7/30

Date: 8/1/80

r	Plank	ton					D	issolved	Gases		
Species	0-5	5-1	0 10-1	5 15-20		D	Т	0	%	CO	Cb
Difflugia Ceratium Uroglea Dinobryum Mellomonas Aneura	1,011 951 399 512 179	456 217 81 55 12	123 6.4 17 55	30		S 2	22.2 21.6	5.45 5.58		-1.4 -3.2	
Polyarthra Triarthra	42 17	29.8	3	0.5		4 6	21.9	5.40		-1.4	
Daphnia Ostracod		1.6		4		8 10	13 10	1.87		1.4	34.8 40.8 40.8
Diaptomus	3.2			.8		12	8.9	.70		1.6	42
Cyclops	21.6	26.4	8 11.2	1.6			0.0	.50		2	41.6
Nauplii Corethra	36	24	6.4	4.8		20	7.3	.62		2.4	42
Melosira Fragillaria Asterionella	59 311	115 477	217 159	85. 29		24	6.6	.09		2.2	44
Anabena	119	85		17					İ		
Clathrocyctis	1	421	571	166							
Oscillatoria Lyngbya	1		294 793	123 55	į						

TABLE 68.

LAKE: TURKEY (Big) (LaGrange and Steuben)
Date: 8/18/30

Plankton

										1 1	i
Species	0-5	5-10	10-15	15-20		D	т	0	%	CO ₂	Cb
		157				s	23.5	4.70		-1.6	33.8
Ceratium	1,105			l	ļ	2	23.4	5.07		-2.0	34.6
Dinobryum *	1,177 25	64			1	4	23.3	5.19		-1.4	33.4
Aneura Hexarthra	123 8.5	8.5	1	1		6	18.3	2.61		0	38.8
Polyarthra	8.5	4.2	Ì	ì	l			1		.4	46.8
Noltholca	0.0	7.2		1		8	12.5	.21		1	46.8
Daphnia	20	8	ļ	į.	1	10	11.5	.10	İ	.4	1 1
Dapinia				1	1	12.5	11.1	.08	1	.4	49.0
		1			1	1	ì	1		1	
Diaptomus	14	3.2				1					
Diaptomus	14 14	3.2	1	1	1	i	1	1		1	
Cyclops	16	4		1		1	1				1
Nauplii	115	12.8	1	1		1				1	
	İ	1	ì			1				1	1
Melosira	951	358	1		1						
Fragillaria	21	-	1								
Asterionella	12	1			-				1		1
Anabena	21	8	-	1		1					1
Clathrocyctis	166	166									
Oscillatoria	1,122	302					1		1	İ	į
Lyngbya		34			-						

TABLE 69. LAKE: NORTH TWIN Date: 9/2/30

Plankton

Q.,								Di	ssolved	Gases		
Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO	Cb	рН
Ceratium	495	98				s	20.0					PIL
Dinobryum	861	209				2	23.8	6.16		-3.0	31.0	8.2
Aneura	72	46					23.8	6.13	104	-3.0	31.0	8.2
Polyarthra	81	8			İ	4	23.3	6.36	107	2.8	31.4	8.2
Noltholea		38			- 1	6	21.3	5.50		-1.0	31.4	8.2
Daphnia	6.4	1 1		.		8	15.5	.41		0	38.2	7.5
				1		11	12.2	.32		1.0	21.6	7.4
Diaptomus Cyclops Nauplii	24 15 21	4 4.8										
Melosira Fragillaria Asterionella	34 1,501	76 631										
Anabena	25	25										- 1
Clathrocyctis	1 1	78	i		1					- 1	- 1	
Oscillatoria	1 1	40					- 1					- 1
yngbya		15										

TABLE 70.

LAKE: SOUTH TWIN Date: 9/2/30

Plankton

Species	0-5	5-10	10-15	15-20		D	Т	0	%	CO2	Cb	
		162	42			s	23.8	6.25	106	-3.2	29.8	
Ceratium	182	1	i .			2	23.8	6.18	105	2	29.6	
Dinobryum	55	16	17		1	4	23.3	6.18	104	-2.4	29.8	
Aneura	46	68	25			Į.	21.66		102	-2.0	30.0	
Polyarthra	166	42	8		į	6	i	6.12	100	0	36.8	Ì
Noltholea	1		12		1	8	19.4	1		1.0	38.4	1
Daphnia	5.6	4		1	1	10	11	1.86		1	39.6	Į
(Ampirion	1			1		12	9.4	.38	ì	1.2	38.6	-
	1					15	9.1	0		1.6	44.4	1
Diaptomus	17	11.2	2.4	Ì		1	1			1		İ
Cyclops	57	24	6.4	l					İ			į
Nauplii	44	12	5.6					1				Ì
1				1		1			İ			Ì
Melosira	34	89	38	į						1		į
Fragillaria	349	243	101	1	İ			ì			1	-
Asterionella		12	1									1
Anabena	55	106	12		ļ						į	
Clathrocyctis	712	307	200	1								
Oscillatoria	230	153	46			1					1	
Lyngbya	4	1			-		<u> </u>					_

TABLE 71. LAKE: WALLEN LAKE

Date: 8/24/30

Plankton

1												
Spacies	0-5	5-13	10-15	15-20		D	Т	0	%	CO2	Сь	pН
Ceratium Difflugia Dinobryum	1,361 81	25				s	23.4	5.69		-2.0	39.4	8.3
* Aneura	136 153	4	1			2	22.3	5.67		-1.4	39.6	8.2
Polyarthra	199	34				4	22.2	5.68		-2.0	39.4	8.2
Hexarthra Noltholea	21	4	_			6	16.9	23.8		1.0	50.0	7.7
	j	4	j			8	11.9	0		2.4	51.0	7.7
Daphnia	13.6	5.6				10	11.1	0		4.0	51.0	7.1
Diaphonosona	6.4		1	1	- 1						1	
į			1			13.5	10.5	0		.2	52.4	7.1
Diaptomus	13.6	.8		1	-		[- 1		ł	1	j
Cyclops	56	12	-	İ		- 1	i			1	j	
Nauplii	110	29			-			- 1				
Corethra		102				-				ĺ	ĺ	
Melosira	4,906	541	i		٠	İ	1					
Fragillaria	183	29			-			- 1	- 1	ĺ		
Asterionella	12		- 1			İ			i		į	İ
Anabena	208	63									1	
Clathrocyctis	2,338	2,453			-				į		1	
Oscillatoria	780	294			-				į			- 1
Lyngbya	59	3,366					- 1				İ	